THE

FLORA SYLVATICA FOR SOUTHERN INDIA,

PART XXV,

BY

MAJOR R. H. BEDDOME

1873

III
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MALLOTUS PHILIPPINENSIS. (Nat. order Euphorbiaceæ.)

MALLOTUS, *Lour.*—GEN. CHAR. Diœcious or rarely monœcious, calyx 2-5 cleft, valvate, petals none, disk none or very rarely present in the female flower. *Male*, stamens numerous central free or shortly united at the base, anthers 2-celled, rudiment of ovary none, or rarely a minute one present. *Female*, ovary 3-(or rarely 2-5-) celled, cells 1-ovuled, styles as many as the ovary cells, simple recurved usually densely plumose on the inner side, capsule dividing into 3 (or rarely 2-5) cocci, seed ecarunculate, albumen copious, cotyledons broad, radicle short. Trees or shrubs, leaves alternate or opposite 3-5 nerved at the base bistipulate entire toothed or lobed, usually with 2 depressed glands at the base, flowers in racemes or spikes terminal or very rarely axillary. *Lour. Fl. Cochinch. p.* 781. Rottlera, *Roxb.* Echinus, *Lour.* Elateriospermum, *Blume.* Melanolepis, *Reichenb.* Boutonia, *Boj.* Cordemoya, *Baill.* Adisca, *Bl.* Echinocroton, *Mueller.* Haucea, *Seem.* Axenfeldia, *Baill.* Plagianthera, *Reichenb.*

MALLOTUS PHILIPPINENSIS. (Lam.) A middling sized tree, young branches minutely hoary tomentose, leaves oblongo-elliptic to ovate obtuse or with a long acumination, 3-6 inches long entire rather coriaceous, glabrous above except when young minutely hoary tomentose or often glaucous beneath and there furnished with minute red glands 3-nerved at the base, furnished at the base on the upper side with 2 depressed glands, petioles ½-2 inches long terminal at the apex, spikes axillary and terminal dense and paniculate in the male, generally solitary in the female, 3-4 inches long, bracts triangular ovate acute 3-flowered in the male and 1-flowered in the female, flowers small; calyx hoary tomentose and furnished with red glands, stamens about 26, anthers glandular, styles shortly united with plumose recurved branches, capsule 3 coccous, each of the cocci the size of a small pea, covered with red glandular tomentum. *DC. Prod.* xv. 980. Croton Philippinensis, *Lam. Ency. vol.* 2, *p.* 206. C. punctatus, *Retz.* C. coccineus, *Lam.* C. montanus, *Willd.* Rottlera tinctoria, *Roxb. Fl. Ind.* iii. *p.* 827. R. aurantiaca, *Hook. et Arn.* R. affinis, *Hassk.*

This tree is common throughout the Madras presidency, and in Bengal, Bombay, Birmah, Ceylon, &c., and it is also found in Java, the Philippines, Australia and Hongkong. In Southern India it ascends the mountains to about 5000 feet, but is also common in the forests of the plains; the wood is occasionally used by the natives for ordinary purposes, and the bark is in use for tanning. The red mealy powder off the capsules is a valuable product and might be a source of considerable revenue in many of our forest districts; it is used as an orange dye principally for silk. The ripe capsules are gathered in March and rubbed together or shaken in bags till the farina separates. It is known as Kapli or Kamila powder, and the silk dyers use the following method:—4 parts of the powder, 1 part of powdered alum, 2 parts of salts of soda, rubbed well together with oil of Sesamum and then boiled in water; it is sufficient however to mix it with water containing ½ its weight of carbonate of soda. The powder is much adulterated in our bazaars, but some collected carefully by the Forest Department, realized a high price in the English markets. The tree is called Kapli almost throughout this Presidency, and is known by the names of Kameel and Kamila in Hindoostani; and in Ceylon it is called Hamparandella, and in Bombay Shendree; the powder is also supposed to be of value as a vermifuge.

Analysis.

1. A portion of the male inflorescence magnified.
2. A male flower bud, calyx 4-cleft, segments valvate.
3. The same more advanced, showing the red glandular dots.
4. A full flower, stamens central about 26, no petals, or disk, or abortive ovary.
5. Anthers, front and back view, showing the glandular dots.
6. Female flower.
7. Calyx.
8. Ovary cut vertically, ovules pendulous.
9. A style very highly magnified.
10. Ovary cut transversely, 3-celled, cells 1-ovuled.
11. A capsule.
12. Lower portion of a leaf upper surface, showing the 2 glands at the base. (All drawn from living specimens.)

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Gonzalo del.

Mallotus Philippinensis. (Lour.)

MISCHODON ZEYLANICUS. (Nat. order Euphorbiaceæ.)

MISCHODON, *Thw.*—GEN. CHAR. Diœcious, calyx of both sexes imbricate 6-(rarely 4-5-) parted, petals wanting or 1-4 present much smaller than the calyx-lobes. *Male*, stamens 6 (rarely 4-5-7) inserted round the base of the 3-lobed rudiment of an ovary, which is imbedded in the disk; filaments elongate free at the base opposite the calyx-segments when equal in number, anthers 2-celled dehiscing longitudinally (cells at length divaricate) affixed nearly at the apex. *Female*, disk thick annular more or less lobed conspicuous, ovary 3-(rarely 4-) lobed, 3-(rarely 4-) celled, cells 2-ovuled, the ovules pendulous from a thick placenta, stigmas subsessile as many as the cells of the ovary connate at the base, dilated at the apex, somewhat recurved simple or somewhat 2-lobed, capsule 3-(rarely 4-) coccous, seeds ovoid slightly compressed ecarunculate and exarillate, solitary in the cells, furnished with a conspicuous hook at the apex, testa smooth castaneous, cotyledons oblong, radicle short. A tree, leaves opposite or 3-5-verticellate penniveined entire, flowers small in axillary panicles. *Thw. in Hook. Kew Journ. of Bot.* 1854, *p.* 299, *t.* 10-*B.*

MISCHODON ZEYLANICUS: (Thw.) A large tree, young branches tetragonous minutely pubescent, leaves glabrous except when very young, 3-5-verticellate, entire oblong obtuse or emarginate at the apex, narrow towards the base, 4-15 inches long by 1-5 inches broad, minutely reticulated; petioles pubescent ¼ to 1½ inch long. *Male*, panicles pubescent axillary about 5 inches long bracteated, the glomerules many-flowered, pedicels short, stamens about 3 times as long as the calyx, filaments and anthers hairy, female panicles or racemes shorter than the male but somewhat elongating in fruit, ovary hairy, capsule glabrous 10-15 lines in diameter, seed brown, hooked at its apex. *Thw. l. c.* ;—*DC. Prod.* xv. *p.* 1124. (Wrong as to the number of the ovules.)

This fine tree is common in Ceylon in the vicinity of Colombo and near Kandy; the young leaves are of a beautiful red color; it is known by the name of Tamana. The timber is excellent. It seeds abundantly, and is most readily propagated from seed, and has been introduced into this presidency. I do not know that it occurs in our southern provinces, but I have a specimen of doubtful origin.

Analysis.

The figure represents branch of female tree in fruit.

1. Portion of a male panicle magnified.
2. A male flower open, showing 6 sepals and 1 petal, 6 stamens each opposite one of the sepals, and the abortive 3-lobed ovary.
3. Male flower, side view, showing 6 stamens.
4, 5. Male flowers with 4-5 stamens.
6. Anther, front view, cells somewhat divaricate, filament and anther-cells hairy.
7. Anther, back view, filament attached nearly at the apex at the back.
8. Female inflorescence.
9. Female flowers, petals sometimes present, ovary 3-lobed seated on a thick disk, styles short thick recurved.
10. A 6-cleft female calyx open.
11. Female flower with a 4-lobed ovary and 4 styles.
12. Ovary cut vertically, ovules 2 in each cell attached to a thick placenta pendulous from rather above the apex of the axis.
13. Ovary cut transversely, 3-celled, each cell 2-ovuled.
14. A 4-lobed ovary cut transversely.
15. A fruit with 3 cocci.
16. A fruit with 4 cocci.
17. Valves of the fruit after it has burst.
18. A seed showing the hook at the apex.
19. Seed cut vertically, showing the embryo lying in albumen. (All drawn from flowers in spirits.)

Mischarton Feyliniacus, Hea.

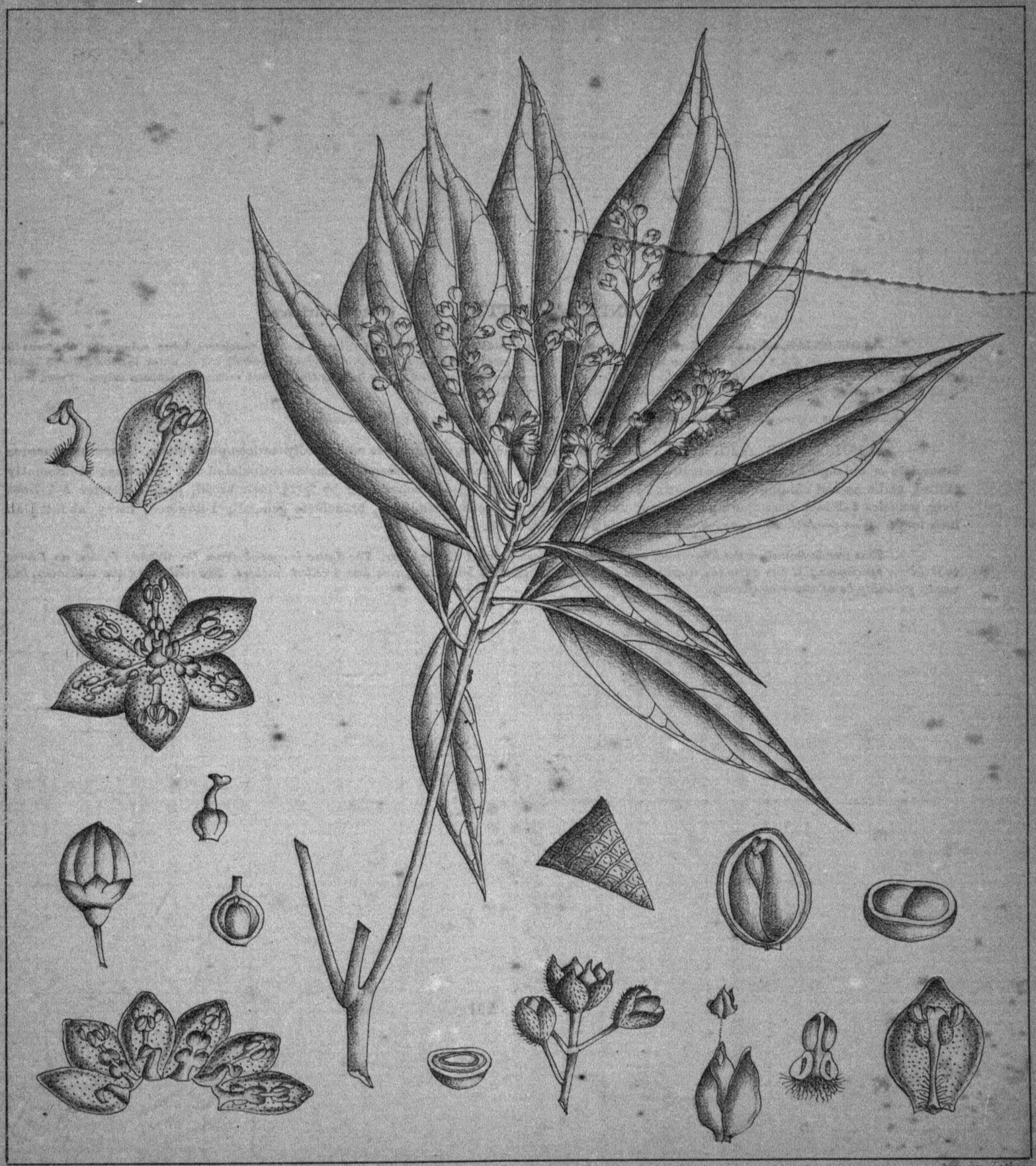
APOLLONIAS ARNOTTII. (Nat. order Laurineæ.)

APOLLONIAS, *Nees*.—GEN. CHAR. Flowers hermathrodite, calyx infundibuliform 6-cleft persistent, lobes subequal. Stamens 9 fertile, filaments filiform, the 3 inner ones furnished with 2 stipitate glands at the base, anthers oblong all 2-celled, the 6 outer introrse, the 3 inner extorrse; staminodes 3. Style short, stigma depresso-subcapitate, berry oval surrounded at the base by the 6-lobed enlarged hardened calyx. Trees, leaf-buds naked, leaves penniveined, panicles axillary and subterminal, flowers small naked.

This genus differs from Phœbe in its 2-celled anthers, and from Hassia in its persistent calyx.

APOLLONIAS ARNOTTII. (Nees.) A good sized tree, young parts adpressedly sericeo-puberulous, leaves chartaceous lanceolate or oblongo-lanceolate attenuated at both ends much acuminated, delicately immerso-reticulated and somewhat prominently ribbed, glabrous and shining above, sparingly puberulous beneath, 2½-5½ inches long by ¾-1¼ inch broad, petiole slender 3-5 lines long, panicles 1-2 inch long sparingly puberulous or at length glabrous racemiform, branchlets generally 1-flowered, berry about ½ an inch long. *Nees*;—*DC. Prod.* xv. *p.* 65;—*Wight Icones tab.* 1819.

This tree is found on the Tinnevelly and Travancore ghats, and in Malabar. The figure is copied from Dr. Wight's Icones, as I have mislaid my specimens; it has quite the appearance of Phœbe lanceolata, but that genus has 4-celled anthers. The timber is quite unknown, but would probably be of superior quality.



Lorenzo del.

Apollonias Arnottii (Nees.)

PHŒBE WIGHTII. (Nat. order Laurineæ.)

PHŒBE, *Nees.*—GEN. CHAR. Flowers hermathrodite, calyx infundibuliform 6-cleft, lobes subequal persistent with the hardened tube, fertile stamens 9, filaments filiform, the 3 inner ones each furnished with 2 glands at their base, anthers ovate all 4-celled, the 6 outer introrse, the 3 inner extrorse, staminodes 3 stipitate cordate at the apex. Style filiform, stigma angulato-discoid, berry seated on the cup-like 6-cleft persistent calyx which is supported by the more or less thickened pedicel. Trees, leaves alternate or subverticelled, penniveined or (in species not Indian) 3-nerved, flowers naked in axillary or terminal subcymose panicles.

PHŒBE WIGHTII. (DC.) A good sized tree, branchlets tawny pubescent, leaves coriaceous oblong obovate or elliptic acute or acuminate, above glabrous in age (except sometimes the impressed costa and veins) and somewhat shining, beneath tawny pubescent, penniveined, the veins much raised beneath, the veinlets prominently reticulated beneath but invisible above, 2-5 inches long by 1-2¼ inches broad, petioles tawny 3-6 lines long, panicles tawny-pubescent axillary shorter than the leaves racemiform or sparingly branched, branchlets 3-flowered, flowers hoary, fruit-calyx much enlarged. *DC. Prod.* xv. 38. Phœbe lanceolata, *Wight Icones tab.* 1820 (not *Nees.*).

This tree is very common about Ootacamund and the higher ranges of the Nilgiris, and in many other localities along our Western Ghats at considerable elevations, but it is absent from Ceylon. It is in flower and fruit all the year round. The tree is called Kumara by the Burghers on the Nilgiris ; it yields a good dense wood of a light red colour, which is in use for various purposes with the natives.

Analysis.

1. Portion of the raceme.
2. Flower buds.
3, 4. A full flower opened out and the ovary removed, calyx 6-fid, stamens 9, the 6 exterior with 4-celled introrse anthers, the 3 interior with 4-celled extrorse anthers, and with 2 glands at the base, staminodes 3 stipitate opposite alternate exterior stamens.
5. Inside view of one of the 3 interior stamens, showing the two glands at its base and its extrorse anthers.
6. Outside view of the same.
7. One of the alternate stamens of the outer row with the staminode in front of it, anthers introrse.
8. A staminode.
9. Ovary, style and stigma.
10. Ovary cut vertically.
11. Ovary cut transversely.
12. Portion of a branch in fruit, the berry seated in the persistent calyx with the pedicel thickened. (Drawn from living specimens.)

Covindo del.

Phœbe Wightii, DC.

TETRANTHERA WIGHTIANA. (Nat. order Laurineæ.)

TETRANTHERA, *Jacq.*—GEN. CHAR. Flowers diœcious. Perianth-segments 6, equal or nearly so, or rarely unequal or fewer by abortion. Stamens of the outer series usually 6, perfect, of the inner series either 6 perfect, or 3 perfect alternating with 3 staminodia, or the whole number more or less increased; anthers all introrse, or the inner ones sub extrorse, 4-celled; glands usually 6, one on each side of 3 inner stamens, the stamens reduced to staminodia in the female flowers, but the glands usually present. Ovary imperfect or wholly abortive in the males, free in the females; stigma usually dilated and toothed or lobed. Berry resting on the more or less enlarged flat concave or cup-shaped perianth-tube, the segments deciduous. Trees, leaves alternate or rarely irregularly opposite penniveined. Flowers in cymes reduced to small umbels, heads or clusters within an involucre of 4 concave deciduous bracts arranged in short racemes or clusters in the axils or at the leafless nodes.—Cylicodaphne, *Nees*;—*Benth. Fl. Aust.* v. 304.

TETRANTHERA WIGHTIANA. (Wall). A good sized or large tree, branchlets compressedly angular at the apex, fusco-tomentose; leaves rigidly coriaceous elliptic or oval or obovate-oblong obtuse or acute, above green and glabrous except the costa, the veins impressed, the veinlets obscure, beneath rather densely tomentose and glaucous or sub-glabrous, the veins and veinlets very prominent and much raised, 3-8 inches long by 1-3 inches broad, petioles 3-8 lines long; racemes 1-3½ inches long floriferous nearly to the base hoary or fusco-puberulous; involucre 4-5 leaved 4-6 flowered, when closed 3-4 lines, when open 5-6 lines in diameter, the inner leaves of the involucre and calyx silky; stamens pilose at the base; berry oval, nearly ½ an inch long, half immersed in the cup-shaped enlarged truncated tube of the calyx. *Wall. List. N.* 2557. Cylicodaphne Wightiana, *Nees*;—*DC. Prod.* xv. 200;—*Wight Icones tab.* 1833.

Vary *α. tomentosa*—Leaves densely fulvo-or fusco-tomentose beneath.

Vary *β. glabrescens*—Leaves sparingly puberulous or glabrous beneath.

A handsome tree, common in many of our western forests from Canara down to Cape Comorin, from about 2000 *feet elevation up to about* 8000; *it is very abundant on the Nilgiris, where it is called Keynjee by the Burghers. The wood is yellowish, with a satiny appearance, and a darker heart; it is used for rafters and various other purposes.*

Analysis.

The plate represents the male and female trees.

1. An involucre of male tree in young state.
2, 3. Involucre of male flowers.
4. A male flower opened, 12 stamens, the 6 outer introrse, the 6 inner subextrorse and furnished with 2 glands at the base.
5. 2 stamens, one of the outer and one of the inner series, with the 2 glands at the base of the latter.
6. The abortive ovary.
7. An involucre of the female tree in young state.
8. An involucre of flowers.
9. A flower bud.
10. A female flower opened out, stamens 12 sterile.
11, 12. The sterile stamens.
13. Ovary, style and stigma.
14. Ovary cut vertically.
15. Fruit, the berry semi immersed in the cup-like tube of the calyx. (Drawn from living specimens.)

Tetranthera Wightiana (Wall.)

LITSÆA ZEYLANICA. NEES. (Nat. order Laurineæ.)

LITSÆA, *Juss.*—GEN. CHAR. Flowers diœcious, calyx 4-6 parted, lobes subequal. *Male*, stamens 6, the 2 interior ones with 2 glands at the base, anthers all 4-celled and introrse. Staminodes none. *Female*, sterile stamens 4-6 ligulate or spathulate, the 2 or 3 inner ones furnished with glands on both sides at the base. Style filiform. Stigma discoid. Berry resting on the flat sometimes dilated perianth-tube, the segments persistent or deciduous. Trees or shrubs, leaves alternate frequently crowded and almost whorled at the ends of the shoots, usually penniveined but with few primary veins and the lowest pair more prominent so as often to appear triplinerved. Flowers in sessile or nearly sessile clusters, surrounded by several very deciduous imbricate bracts.

LITSÆA ZEYLANICA. (Nees.) A large tree, the branches and inflorescence quite glabrous or scarcely hoary with a very minute tomentum. Leaves ovate-elliptical or elliptical-oblong acuminate, contracted at the base, 3 to 5 inches long, glabrous and green above, white or glaucous underneath, penniveined but with few primary veins, the lowest pair more prominent than the others. Flowers in sessile clusters in the axils or at the old nodes, on pedicels of 1 to 2 lines, usually glabrous as well as the perianths. Perianth-segments ovate oblong obtuse. Filaments exserted, with a few hairs about the base ; glands of the two inner ones stipitate. Berry globular or slightly ovoid, resting on the persistent perianth-tube, expanded into an entire or slightly angular flat disk of 2½ to 3 lines diameter, the segments entirely deciduous. *Meissn. in DC. Prod.* xv. i. 226 ;—*Wight Ic. t.* 132 *and* 1844 ;—*Benth. Fl. Aust.* v *p.* 307. L. foliosa, *DC. Prod.* xv. 222. L. scrobiculata, *DC. l. c. p.* 223. L. umbrosa et consimilis, *DC. l. c. p.* 223.

This tree is most abundant on the Nilgiris at 6000-7000 *feet elevation, and is found throughout our Western Ghats at elevations above* 2000 *feet, and it is equally common in Ceylon, where it is called Dawal-kooroondoo. Its wood is in use for house-building purposes, planks, rafters, &c., it is yellowish in color, straight-grained and tough, and when fresh emits an odour of Sweet Briar ; it is called Belori by the Burghers on the Nilgiris.*

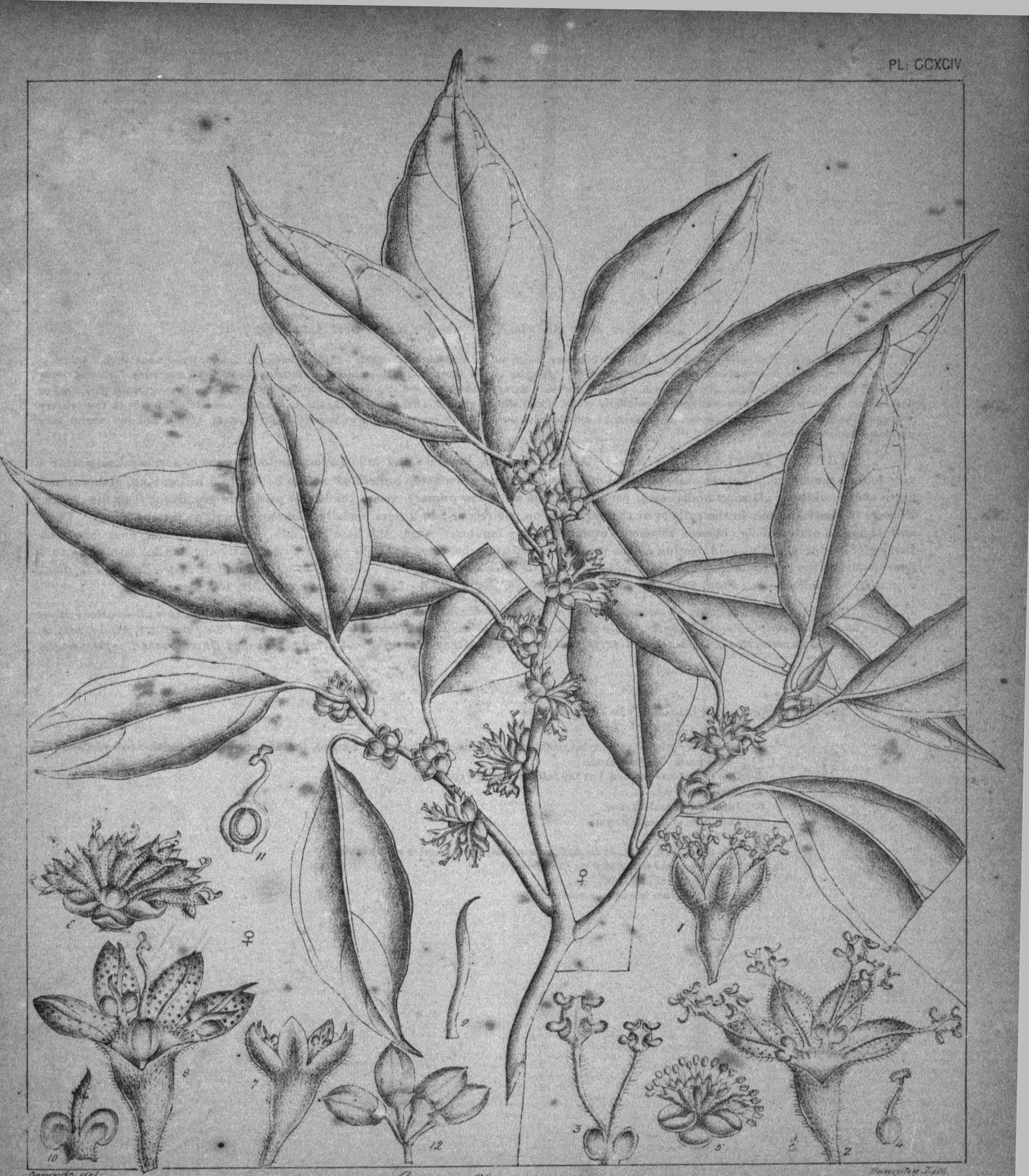
Analysis.

The figure represents a branch of the female tree.

1. A male flower.
2. The same open, calyx 4-parted, stamens 6, anthers all introrse and 4-celled, the 2 interior stamens with a pair of glands at the base. No staminodes.
3. One of the exterior and 1 of the interior stamens removed.
4. Abortive ovary.
5. Involucre of male flower.
6. Involucre of female flower.
7. A female flower.
8. The same open, 6 sterile ligulæform stamens, the 2 interior with glands.

9, 10. Sterile stamens removed from the flower.

11. Ovary cut vertically.
12. Fruit. (Drawn from living specimens.)



Lusæa Zeylanica (Nees)

ACTINODAPHNE SALICINA. (Nat. order Laurineæ.)

ACTINODAPHNE, *Nees.*—GEN. CHAR. Flowers diœcious, calyx 6-4-fid, the lobes subequal deciduous. *Male*, stamens 9-6, the 3-2 inner ones each furnished with 2 sessile or stipitate glands at the base, anthers oblong all 4-celled and introrse. Staminodes none, an abortive rudiment of an ovary. *Female*, sterile stamens 9, (rarely only 6) ligulæform, the 3(-2) inner ones furnished with 2 glands above the base, style filiform, stigma discoideo-sublobate ; berry seated on the persistent cup-shaped or rarely flat truncate base of the calyx. Trees or shrubs, flowers without any involucres entire in sessile clusters surrounded by imbricate scales or in racemes or panicles.

ACTINODAPHNE SALICINA. (DC.) A middling sized tree, young parts sericeous, branchlets verticelled, leaves in verticels of 5-8 together, slightly coriaceous lanceolate acute at both ends, glabrous in age except often the costa beneath, sericeous round the margins when young, very glaucous beneath, veins obscure, minutely scrobiculato-reticulated on both sides (under the lens), $2\frac{1}{2}$-5 inches long by 5-12 lines broad, petiole 3-6 lines long, fascicles subsessile 3-8 flowered sericeous, pedicel in fruit 4 lines long, berry 4 lines in diameter. *DC, Prod.* xv. *p.* 212.

This tree is rare on our Western Ghats. I have only detected it in South Tinnevelly. Dr. Wight found it on the Nilgiris, and it occurs in Ceylon ; the primary veins in my specimens are much fewer than described by DeCandolle, and I am not certain that this is his tree ; it is however closely allied to the Ceylon A. elegans, Thwaitesii, and stenophylla, and they are all probably only varieties of one species. I know nothing of its timber, but it would probably be of good quality.

Analysis.

1. Branch of a female tree in flower.
2. A flower bud (female.)
3. A female flower.
4. The same open, perianth 6-lobed, 9 ligulæform sterile stamens, the 3 inner each with 2 glands above the base, the outer glandless.
5. One of the inner row of gland-bearing sterile stamens.
6. One of the outer row of glandless stamens.
7. Ovary, style and stigma.
8. Ovary cut vertically.
9. Fruit, the berry seated in the cup-like truncate base of the calyx, the lobes having fallen away. (All drawn from flowers in spirits.)
10. Male inflorescence of Actinodaphne angustifolia.
11. A male flower of the same open, stamens 9 all with introrse 4-celled anthers, the 3 interior with two glands at the base of each.

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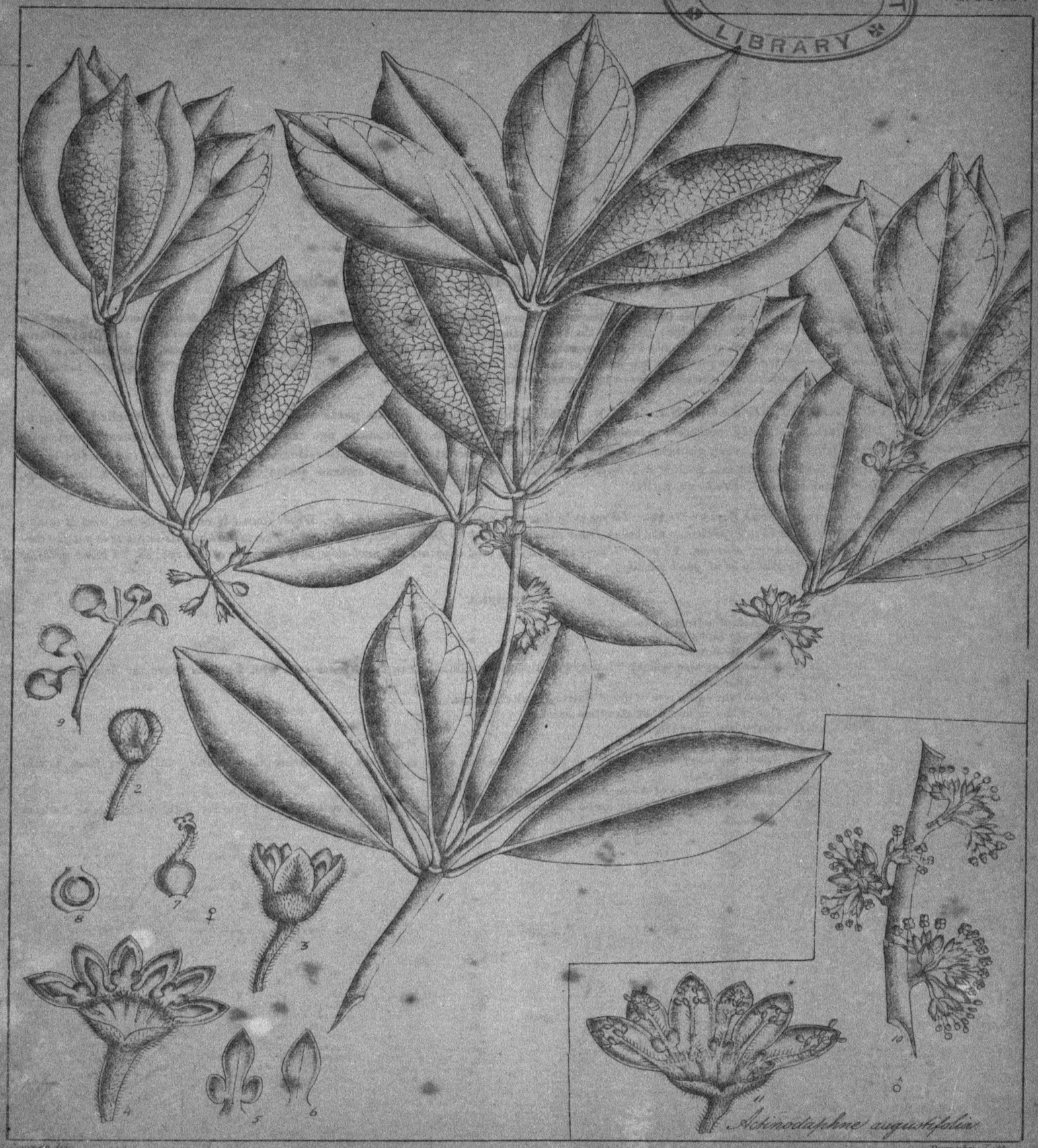


Actinodaphne salicina (D.C.)

ACTINODAPHNE HOOKERI. (Nat. order Laurineæ).

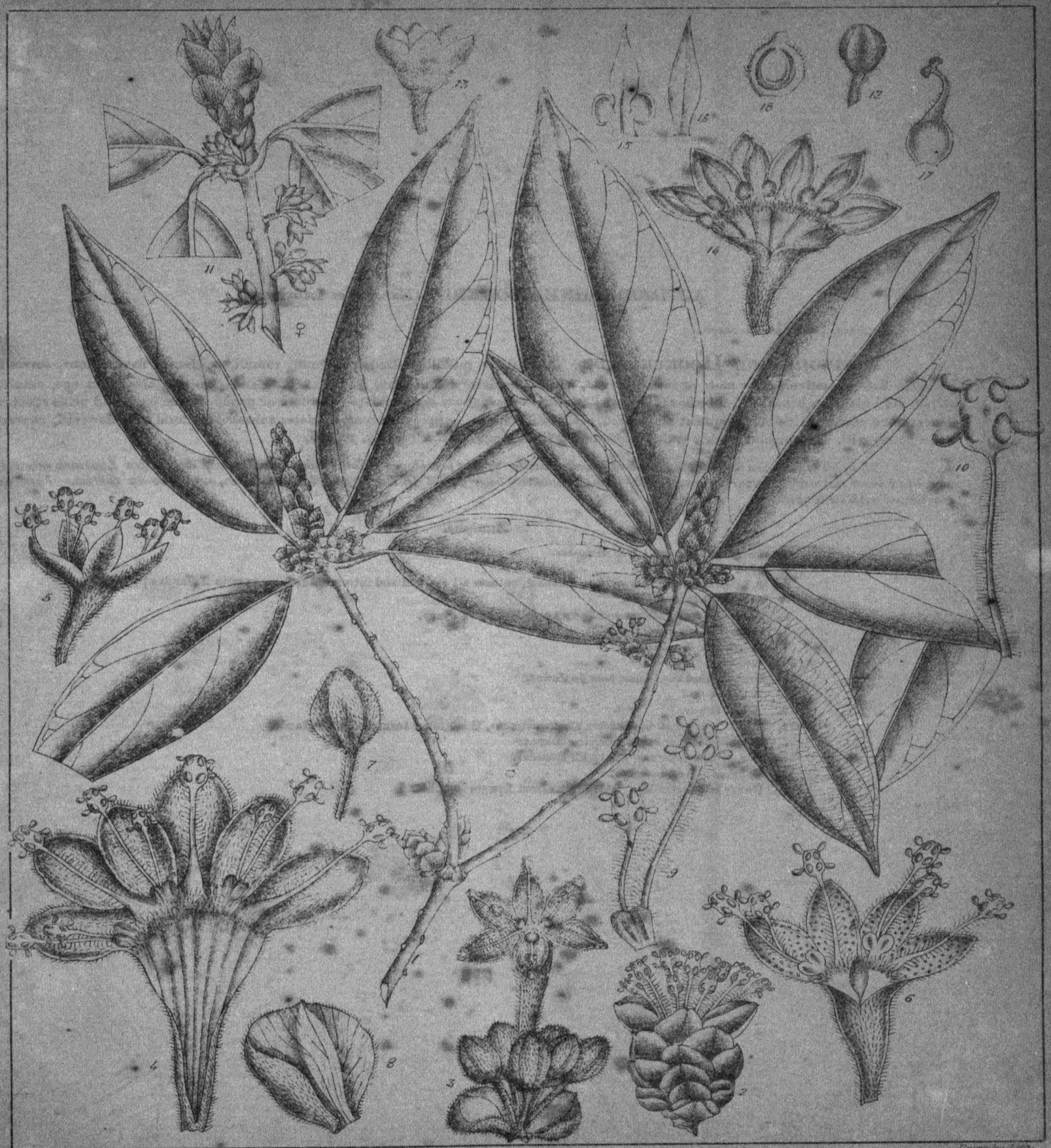
For Gen. Char. see Pl. ccxcv.

ACTINODAPHNE HOOKERI. (DC). A small or middling sized tree, young ramuli and leaves flavo-villous, leaves in verticels of 5-8 penniveined or more or less 3-nerved, coriaceous narrow lanceolate acute at both ends, quite glabrous in age, shining above, very glaucous beneath, 5-9 inches long by 1½-2 inches broad, above scrobiculato-reticulate or punctate, the costa and veins obscure, beneath the costa and veins prominent and raised, petioles 3-8 lines long pulveraceous, fascicles subsessile lateral few-flowered, covered when young with suborbicular golden scales, pedicels 1-2 lines long. *DC. Prod.* xv. *p.* 218.

This tree is very common on the hills on the eastern side of the presidency (North Arcot, Cuddapah, &c.) where Laurineæ are very rare, but I never met with it in our western forests; it has however been found in Bombay and the Concan, and also in Sikkim. I am not acquainted with its timber.

Analysis.

1. Branch of the male tree in flower.
2, 3. Male inflorescence.
4. A 6-lobed male flower open, stamens 9, anthers all 4-celled and introrse, the 3 inner with 2 glands at the base.
5. A 4-lobed male flower.
6. The same open, stamens only 6, a small abortive ovary.
7. A male flower bud.
8. A bract or floral scale.
10. Stamens.
11. Branch from the female tree in flower.
12. A flower bud.
13. A full flower.
14. The same open, 9 ligulæform sterile stamens, the 3 inner furnished with glands.
15. One of the inner row of sterile stamens.
16. One of the outer row of sterile stamens.
17. Ovary, style and stigma.
18. Ovary cut vertically. (All drawn from flowers in spirits.)



Actinodaphne Hookeri (D.C.)

ALSEODAPHNE SEMICARPIFOLIA. (Nat. order Laurineæ.)

ALSEODAPHNE, *Nees.*—GEN. CHAR. Flowers hermathrodite, calyx deeply 6-parted, lobes subequal deciduous from the base, fertile stamens 9, filaments filiform or dilated, the 3 inner furnished with 2 subsessile glands near the base ; anthers ovato-oblong 4-celled, those of the 6 outer stamens introrse, those of the 3 inner extrorse. Staminodes 3 stipitate cordate or sagittate at the apex. Style filiform, stigma discoid or obtusely subtrigonal, berry seated on the entire smooth base of the calyx, the pedicels thickened. Trees, leaves alternate coriaceous penniveined, inflorescence of Cinnamomum, outer segments of calyx usually shorter than the inner ones.

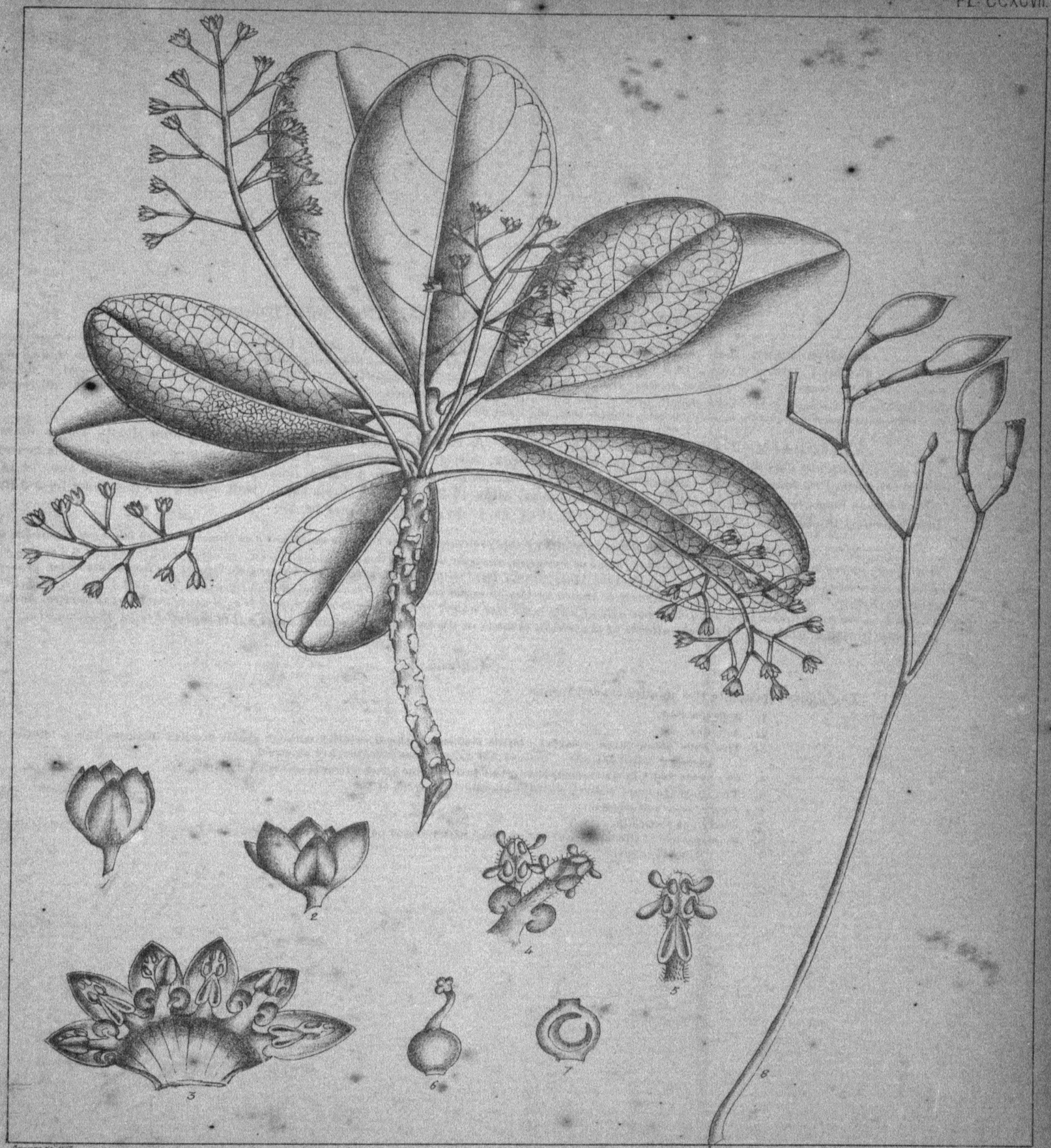
ALSEODAPHNE SEMICARPIFOLIA. (Nees.) A large tree, glabrous except the very young shoots, leaves obovate oval or ovate obtuse narrowed at the base, rounded at the apex, coriaceous glabrous and somewhat shining above, glaucous beneath, finely reticulated on both sides, 3-9 inches long by 1½ to 4 inches broad, petiole 3-9 lines long, panicles axillary or from the old axils 2½-10 inches long corymbosely branched towards the apex, calyx 1½-2 lines long, lobes equal, fruit oblong 4-8 lines long by 3-5 lines broad, pedicel thickened 3-10 lines long. *Nees* ;—*DC. Prod.* xv. *p.* 28 ;—*Wight Icones Pl.* 1826 27.

This tree is not uncommon on the Western Ghats of this presidency, from Canara down to Cape Comorin, up to 5000 feet elevation, and it also occurs in Ceylon. There are 2 different forms or varieties, one with the leaves 3-4 inches long, and the other with the leaves 6-9 inches long, I have not observed that the 2 forms run one into the other, and I have only met with the smaller leaved variety at the higher altitudes, so suspect that the difference is due to elevation. This tree is known in Ceylon under the names Weewarana, Raane (grainwood), and Vaverne, and is there known as a valuable timber ; the wood is procurable of very large size, and is of a light yellow color, and is said not to warp ; it is used for building and other purposes, and as it resists the attacks of the teredo, is much in use in the construction of boats ; it is exported from Trincomallee.

Analysis.

The figure represents the smaller leaved form.

1. A flower bud.
2. A flower.
3. The same open, calyx 6-parted ; fertile stamens 9, the 6 exterior without glands 4-celled introrse, the 3 interior with glands 4-celled extrorse. Staminodes 3, opposite alternate outer stamens.
4. One outer and 1 inner stamen, the former introrse, the latter extrorse and with 2 glands.
5. The alternate outer stamen with the staminode in front of it.
6. Ovary, style and stigma.
7. Ovary cut vertically.
8. Fruit-panicle of the larger leaved form, the berry seated on the thickened pedicel and base of the calyx. (All drawn from dried specimens.)



Fourcade del. Dampsey Lith.

Alocodaphne semicarpifolia. (Nees)

HAASIA WIGHTII. (Nat. order Laurineæ.)

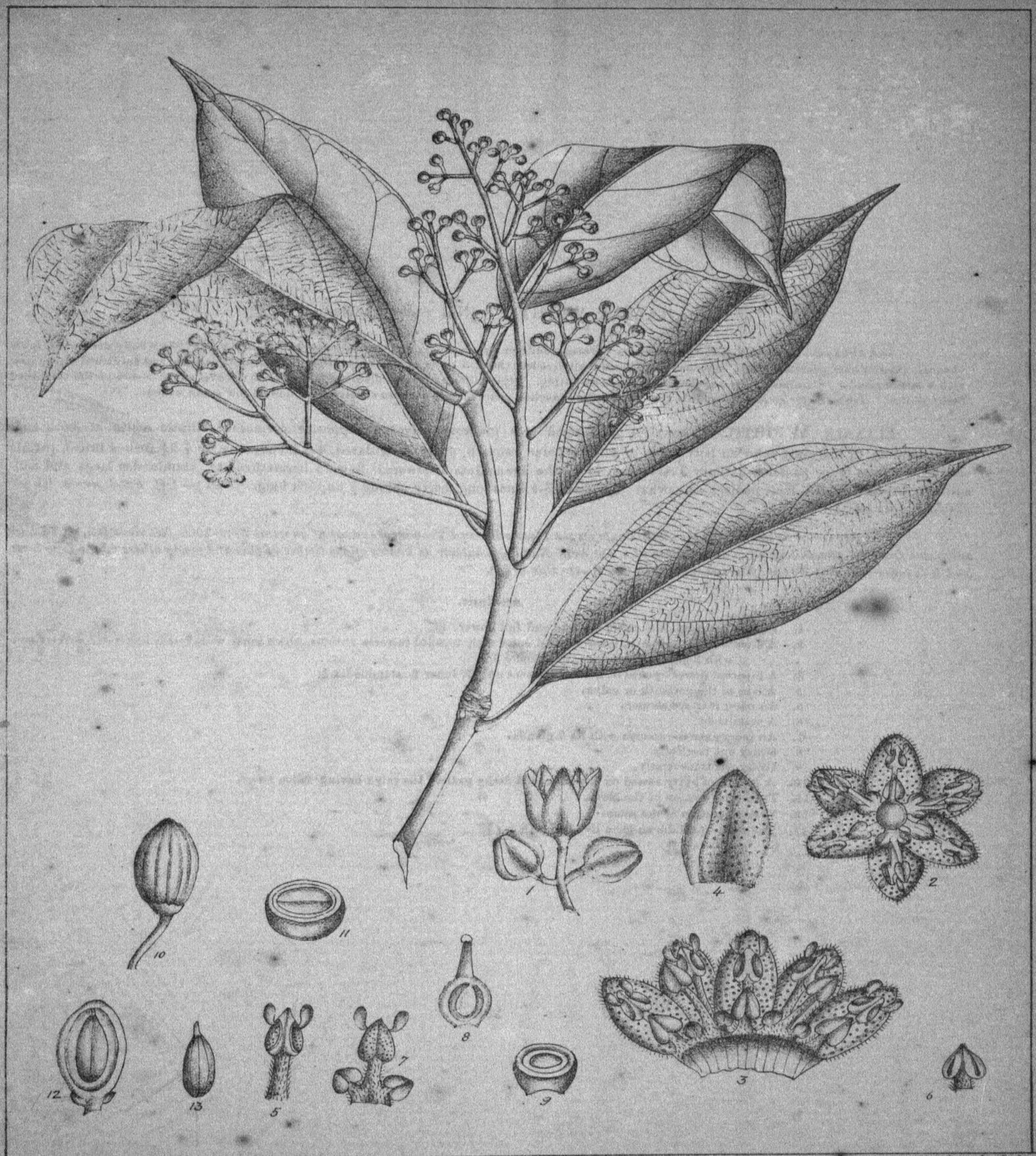
HAASIA, *Blume.*—GEN. CHAR. Flowers hermaphrodite or by abortion monœcious, calyx rather fleshy 6-5 cleft wholly deciduous, lobes unequal, exterior ones generally small, stamens 9 or 7 fertile all 2-celled, the 6-5 outer ones introrse, the 3-2 inner ones extrorse and furnished at the base with 2 sessile glands. Staminodes 3 triangular subsessile, or wanting. Style filiform. Stigma discoid triangular. Berry oval naked seated on the thickened fleshy pedicel. Trees, leaves generally towards the apex of the branches, penniveined, panicles subterminal, flowers few small naked.

HAASIA WIGHTII. (Nees.) A good sized tree glabrous, leaves subopposite coriaceous elliptic acute at both ends rather shining, of the same color on both sides or a little paler beneath, finely reticulated, 4-6 inches long by $\frac{3}{4}$-$2\frac{1}{4}$ inches broad, petiole slender 4-9 lines long, panicles axillary 1-4 inches long, the branchlets 3-flowered, flowers hermathrodite, staminodes large and conspicuous pellucid-dotted, fruit-pedicel somewhat thickened 3-4 lines long, berry oblong $\frac{1}{2}$ an inch long. *Nees ;—DC. Prod.* xv. *p.* 61 ;—*Wight Icones tab.* 1831.

This tree is not uncommon in the moist woods on the Tinnevelly and Travancore range of ghats at 2000-3000 *feet elevation, and I have specimens from the Anamallays from an elevation of* 4,000 *feet. Nothing whatever is known of the timber of this and many others of the Laurineæ, and it is important that Forest officers should pay attention to this order.*

Analysis.

1. Portion of a panicle shewing the bud and full flower.
2. A 6-parted full flower stamens 9, the 6 outer with 2-celled introrse anthers, the 3 inner with 2-celled extrorse anthers and with 2 glands at the base, staminodes 3.
3. A 5-parted flower opened out, outer stamens only 5, inner 2, staminodes 3.
4. A lobe of the perianth or calyx.
5. An outer introrse stamen.
6. A staminode.
7. An inner extrorse stamen with its 2 glands.
8. Ovary cut vertically.
9. Ovary cut transversely.
10. A fruit, the berry seated on the thickened fleshy pedicel, the calyx having fallen away.
11. Transverse section of the berry.
12. Vertical section of the same.
13. The seed. (All drawn from living specimens.)



Gounelle, del. Humphrey, Lith.

Haasia Wightii. (Nees.)

CRYPTOCARYA WIGHTIANA. (Nat. order Laurineæ.)

CRYPTOCARYA, *R. Br.*—GEN. CHAR. Flowers hermaphrodite. Perianth-segments or calyx-lobes 6, equal or nearly so. Stamens of the outer series 6, all perfect with introrse anthers, of the inner series 3 with extrorse anthers, alternating with 3 short staminodia, glands 6 at the base of the inner perfect stamens or almost as near to the outer ones opposed to them. Anthers all 2-celled. Ovary immersed in the perianth-tube which after flowering closes over the ovary, and finally becomes more or less fleshy or succulent, completely enclosing and usually consolidated with the fruit, the limb of the perianth deciduous leaving a small scar at the apex, or rarely persistent. Trees or tall shrubs. Flowers small, in cymes arranged in axillary racemes or panicles, the upper ones often forming an apparently terminal panicle with the subtending leaves very small or deficient. Fruiting-perianths globular ovoid or oblong, having the appearance of inferior fruits.—Caryodaphne, *Blume*;—*Benth. Fl. Aust.* v. *p.* 294.

CRYPTOCARYA WIGHTIANA. (Thw.) A very large tree, young ramuli and leaves minutely puberulous, leaves rigidly coriaceous elliptic and oblong acuminate or acute at the apex, obtuse or acute at the base and often unequal, glabrous and shining above the costa sunken, veins obsolete, very glaucous beneath the costa and veins prominent, the veinlets much reticulated, 2-6 inches long by 1-2½ inches broad, petioles 3-9 lines long, panicles compound many-flowered covered with minute golden tomentum, 1½-4 inches long, fruit ovate-oblong or subspherical ½ an inch long shining black. *Thw. En. Pl. Zey. p.* 254. C. floribunda, *Wight Icones t.* 1829. (not *Nees*).

This fine tree is not uncommon in the moist forests of our Western Ghauts and in Ceylon at elevations from 2000 *up to* 5000 *feet. I have specimens from the Tinnevelly and Travancore Ghauts, Malabar and South Canara. In Ceylon it is called Golu-mora, and its timber is considered valuable for building purposes.*

Analysis.

1. A flower bud.
2. A flower.
3. A flower opened, calyx or perianth 6-parted, stamens 9 fertile, the 6 exterior with 2-celled introrse anthers, the 3 interior with 2-celled extrorse anthers and furnished with 2 glands at the base, staminodes 3.
4. One of the alternate outer introrse stamens with the inner extrorse one opposite it.
5. The same with the inner stamen removed.
6. The inner stamen, outside view.
7. One of the alternate outer introrse stamens with the staminode opposite it.
8. A staminode.
9. Ovary, style and stigma.
10. Ovary cut vertically.
11. A fruit berry quite enclosed in the enlarged persistent tube of the calyx.
12. The same cut vertically. (All drawn from living specimens.)

Cryptocarya Wightiana (Thw.)

HERNANDIA PELTATA. (Nat. order Laurineæ; Sub order Hernandieæ.)

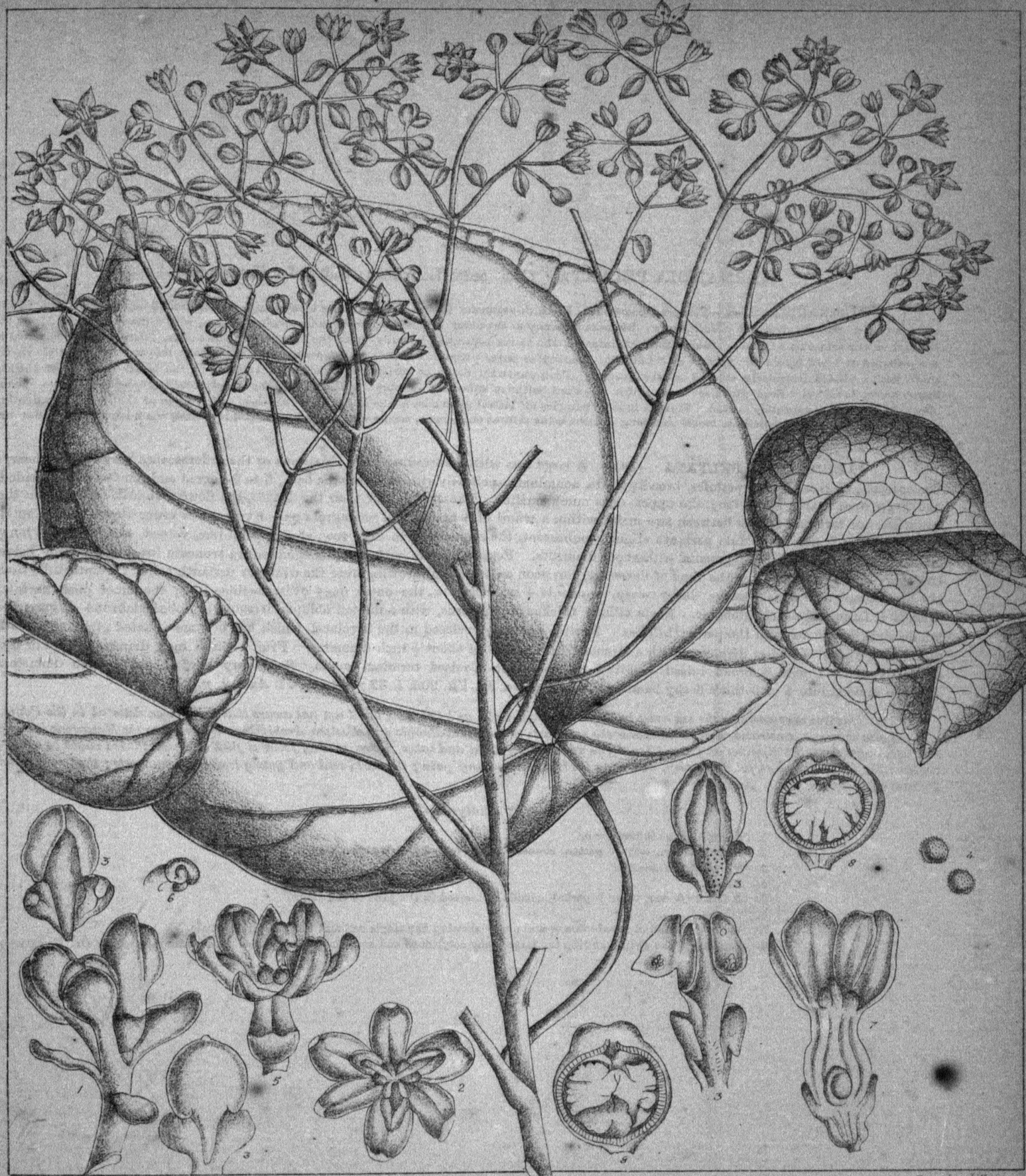
HERNANDIA, *Linn.*—Flowers monœcious. Perianth-segments in two rows, valvate in each row in the bud, 3 or 4 in each row in the males and 4 or 5 in the females. *Male flower.* Stamens as many as the outer perianth-segments and opposite to them, with a gland on each side at the base (or on one side only or none); anthers 2-celled, introrse, the valves separating laterally from the inner to the outer edge. *Female flower* inserted in a cup-shaped or lobed involucel. Glands or staminodia as many as outer perianth-segments and opposite to them. Ovary inferior, fleshy; style short, thick, with a dilated irregularly toothed or lobed stigma. Fruit somewhat fleshy or coriaceous, indehiscent, enclosed in the enlarged fleshy or thickly membranous involucel. Seed globular; testa thick and hard without albumen. Embryo with thick fleshy deeply-lobed cotyledons. Trees, leaves alternate, peltate or palmately nerved. Flowers in loose panicles on lateral peduncles at the ends of the branches, each branch of the panicle terminating in an involucre of 4 or 5 verticellate bracts enclosing 3 flowers, the central one female, sessile within the cup-shaped involucel, the 2 lateral ones males and pedicellate.

HERNANDIA PELTATA. (DC.) A large tree with a spreading head, glabrous or the inflorescence very slightly hoary-tomentose. Leaves on long petioles, broadly ovate, acuminate, peltately attached near the base, 5 to 9-nerved and remotely penniveined, the larger ones nearly 1 foot long, the upper ones much smaller. Panicles shorter than the leaves, the flowers almost clustered on the branches, one terminal female between two males within a whorl of 4 bracts, and sometimes one or two males lower down with a small bract under each pedicel. Male perianth slightly pubescent, the segments 3 in each row, almost petal-like, veined, about 2 lines long. Stamens 3, shorter than the segments with short filaments. Female flowers with a cup-shaped entire truncate involucel a little below the ovary and 1½ lines long at the time of flowering, but soon enlarged and growing over the ovary or perianth-tube. Perianth-tube from the first completely adnate to the fleshy ovary, segments 4 in each row, the outer ones ovate 2 lines long, the inner ones narrow. Glands 4, large and nearly globular. Style villous, thickened upwards, with a dilated oblique irregularly lobed glabrous stigma, the whole style deciduous with the perianth-lobes. Fruit completely enclosed in the involucel which has become inflated globular smooth and fleshy, above 1½ inches diameter, with a circular entire orifice of about ½ inch diameter. Fruit about 1 inch diameter, more or less distinctly marked with 8 broad raised longitudinal ribs, with a raised terminal umbo. Seed very hard, about ¾ inch diameter. Embryo divided into 4 or 5 thick fleshy ruminate lobes. *Seem. Fl. Vit.* 205, *t.* 32;—*Benth. Fl. Aust.* v. *p.* 314.

This tree is common on the sea coast in Ceylon between Galle and Colombo, but I am not aware that it has been detected in the Peninsula; it also occurs in Australia, and extends over the sea coasts in the South-Pacific and Eastern Archipelago westward to the Mascarene islands, and northward to the Philippines and Loo Choo. The wood is very light and takes fire so readily from a flint and steel that it might be used as tinder. The juice is a powerful depilatory, removing the hair without any pain; the bark, seed and young leaves are cathartic; the tree is called Palatee in Ceylon.

Analysis.

1. Portion of the inflorescence.
2. A male flower, calyx 6 parted, stamens 3 each with 2 glands at the base.
3. Views of the stamens.
4. Pollen.
5. A female flower, calyx 8-parted, glands 4 inserted in the jaws of the calyx.
6. Stigma.
7. Vertical section of female flower and ovary shewing the single cell and the pendulous ovule.
8. Sections of the drupe shewing the large fleshy cotyledons and small superior radicle. (All communicated by Dr. Thwaites.)



Hernandia peltata (D.C.)

ORDER LIX—VERBENACEÆ.

Flowers irregular or rarely regular. Calyx persistent, truncate toothed or lobed. Corolla with 4 or 5, rarely 6 to 8 lobes, or rarely truncate the lobes more or less 2-lipped or nearly or quite equal, imbricate in the bud, the upper lip or uppermost lobe or sometimes the lateral ones outside. Stamens inserted in the tube of the corolla, usually 4 in pairs or nearly equal and alternating with its lower lobes, or when the corolla is regular 4 8 alternating with its lobes. Anthers 2-celled, the cells opening longitudinally and usually parallel. Ovary not lobed or only shortly 4-lobed, usually more or less perfectly divided into 2 or 4 cells or half-cells, with 1 ovule in each cell or half-cell, either anatropous and erect from the base, or more or less amphitropous and attached laterally or near the top so as to appear pendulous. Style terminal, simple entire or more frequently with 2 short stigmatic lobes. Fruit dry or more or less drupaceous, the whole fruit or the endocarp separating into 2 or 4 nuts or pyrenes or quite indehiscent and 2 or 4-celled, and sometimes with an additional central cavity between the carpels having the appearance of a third or fifth empty cell. Seeds solitary in each cell, half-cell or pyrene, erect with or without albumen, the testa usually membranous. Embryo straight, with thick cotyledons and an inferior radicle. Herbs, shrubs, trees or woody climbers. Leaves opposite whorled or rarely alternate, without stipules, entire toothed or divided. Inflorescence various.

Fruit or drupe.
- Lower lobe of the corol much longer than the 4 other, tube short.
  - Flowers small, leaves compound ... ... VITEX.
  - Flowers showy, leaves simple... ... ... GMELINA.
- Corol-lobes nearly equal.
  - Corol small usually 4-lobed.
    - Cymes or panicles terminal, style acutely 2-lobed ... ... PREMNA.
    - Cymes axillary, style dilated and truncate at the top ... ... CALLICARPA.
  - Corol 5-6 lobed.
    - Corol tube slender, stamens 4 ... ... CLERODENDRON.
    - Corol tube short, stamens 5 6 ... ... TECTONA.

Fruit a 2-valved capsule ... ... AVICENNIA.

This Order yields the Teak tree, TECTONA GRANDIS, *and* 3 *other valuable timber trees,* VITEX ALTISSIMA *and* PUBESCENS *and* GMELINA ARBOREA. *Of less important trees it gives us another Vitex,* (V. LEUCOXYLON), *three Premnas* (P. TOMENTOSA, SERRATIFOLIA *and* LATIFOLIA), *and one Callicarpa* (C. LANATA), *making a total of* 9 *trees. Of shrubs it yields* 10, *viz.* 2 *species of Vitex,* 1 *of Gmelina,* 3 *of Premna,* 3 *of Clerodendron, and* 1 *of Avicennia. Of scandent plants, undershrubs or herbs not coming under the scope of this Flora there are* 3 *Clerodendrons,* 1 *Congea,* 1 *Symphorema,* 2 *Boucheas,* 1 *Lantana,* 1 *Lippia,* 3 *Premnas and* 1 *Priva.*

VITEX. LINN.

For Gen. Char. see letter-press to Plate cclii.

1. VITEX ALTISSIMA, *L.*—For description, &c. see Pl. cclii.

2. VITEX PUBESCENS, *Vahl.*—A large tree, young branches 4-sided, channelled, and with the petioles and young leaves pubescent or slightly tomentose, leaves 3-5 foliate, petioles 2-4 inches long, leaflets 4-9 inches long by 2½-3 inches broad, elliptic or ovate oblong attenuato-acuminate, rounded at the base subsessile coriaceous penniveined glabrous, shining above, pale finely puberulous beneath, panicles finely villous terminal compound ovato-pyramidal compact, cymes interspersed with foliaceous bracts longer than the calyx, calyx cyathiform sinuately 5-toothed 2½ lines long, corol twice the length of the calyx inflated, inferior lip straightish villous at the base, branches oblong acuminate, drupe globose size of a pea. *DC. Prod.* xi. 685 ;—*Wight Icones.* 1465. Vitex arborea, *Roxb. Fl. Ind.* iii. *p.* 73.

This tree is found throughout our western forests and on our eastern mountains, but it is very much rarer than V. altissima ; it is not uncommon about the foot of the Travancore ghats and on the Tinnevelly mountains at no great elevation ; it also inhabits Eastern Bengal, Birmah, Penang, Sumatra and Java. The timber is of a chocolate color, very hard and durable, and is in use for various purposes ; the tree is called Nowli eragu (Telugu) in the Northern Circars.

3. VITEX LEUCOXYLON, *Linn. fil.*—A large tree, bark soft spongy, young shoots round and smooth often pruinose, leaves opposite on petioles 2-5 inches long, 3-5 foliate, leaflets on petiolules ½ to 1 inch long, oblong or lanceolate generally entire ; sub-coriaceous glabrous and shining above, pale and glabrous or finely puberulous beneath, penniveined, 2-6 inches long by 1-3 inches broad, cymes axillary long peduncled corymbose divaricato-dichotomous, many-flowered, flowers fragrant of a whitish color with the centre of the lower lip violet, calyx patelliform 5-toothed, corol twice the length of the calyx, inferior lip spreading densely hairy, bracts very minute caducous drupe oval smooth shining black, pulp soft black, nut oblong compressed somewhat furrowed. *Linn. fil. Supp.* i. 293 ; —*Roxb. Fl. Ind.* iii. *p.* 74. Wallrothia leucoxylon, *Roth.* Vitex bombacifolia, *Wall.* Vitex saligna, *Roxb. Fl. Ind.* iii. 75.

This tree is sparingly distributed throughout the presidency and Bombay, generally on the banks of streams or rivers ; it is also found in Ceylon, Eastern Bengal and Birmah. In South Canara and part of the Mysore country it is called Hola-nakee (Canarese) ; it ascends the mountains to a little above 3000 feet. The wood is whitish and compact and deserves attention for furniture, and is in use for cart-wheels and various other purposes with the natives ; a cubic foot weighs 42 lbs.

4. VITEX NEGUNDO, *Linn.*—A large erect shrub or small tree with a trunk about 3 feet in girth, the branches, underside of the leaves and inflorescence mealy white, leaves opposite 3-5 foliate, leaflets entire or toothed lanceolate or oblong glabrous or nearly so above, the central one 2-4 inches long, the 2 lower ones smaller and sessile ; flowers small in close opposite cymes forming simple or branched spike-like panicles or rarely the cymes become loosely dichotomous, flowers from white with only a tinge of pink to bluish purple, calyx tomentose not above 1 line long, corol much longer, usually tomentose outside and hairy at the base of the lower lobe. *Linn. Sp. p.* 890 ;—*DC. Prod.* xi. 683 ;—*Wight Icones tab.* 519. V. bicolor, *DC. l. c. p.* 683. V. incisa, *DC. l. c. p.* 684.

This shrub or small tree is common throughout the presidency and Ceylon, generally on the banks of rivers, up to 3000 feet elevation ; it is also found in Bengal. Birmah, the Mauritius, Manilla, Japan, Australia and Hong Kong. It is called Nisinda and Nengar in Hindostanee, and Veyala in Telugu ; the root is bitter and used as a febrifuge, and the leaves bruised are applied to the temples to cure headache.

5. VITEX TRIFOLIA, *Linn.*—A shrub or small tree, the branches, underside of the leaves, and inflorescence mealy-white, leaves 3-5 (rarely 1-) foliate, leaflets sessile or stalked ovate oblong or obovate entire, 1-1½ inches long glabrous or nearly so on the upper side, flowers nearly white or pale blue in small nearly sessile opposite cymes forming short terminal panicles either simple and spike-like or slightly branched, the floral leaves reduced to short bracts. Calyx about 2 lines long very shortly 5-toothed ; corol-tube nearly twice as long as the calyx, the 4 upper lobes short the lowest twice as large and often as long as the tube, and both calyx and corol more or less mealy outside, ovary 2-celled with 2 ovules in each cell, drupe globular smooth black size of a pea. *Linn. Suppl.* 293 ;—*Roxb. Fl. Ind.* iii. *p.* 69.

This is common (chiefly maritime) throughout India and Ceylon, also in Birmah, the Mauritius, Sumatra, Timor, China, Japan, and Australia. The leaves are a powerful discutient ; it has the same native names as the last species.

GMELINA. LINN.

For Gen. Char. see letter-press to Pl. ccliii.

1. GMELINA ARBOREA, *Roxb.*—For description, &c. see Pl. ccliii.

2. GMELINA ASIATICA, *Linn.*—A large shrub, thorny or unarmed, thorns when present axillary opposite horizontal leaf-bearing, leaves petioled broad-oval or obcordate often irregularly lobed, glabrous and shining on both sides or glaucous beneath, 1-1½ inches long by about 1 inch broad, racemes axillary and terminal tomentose, flowers large (1½ inches long) yellow drooping, bracts foliaceous lanceolate cuspidate concave caducous, calyx shortly 4-toothed furnished with discoid glands in front, corol with the lower lip larger than the others, drupe about the size of a filbert. *Linn. Sp. p.* 873 ;*DC.—Prod.* xi. 679 ;—*Roxb. Fl. Ind.* iii. 87. G. parvifolia, *Roxb. Fl. Ind.* iii. 87.

A common shrub throughout India and Ceylon up to 3000 feet elevation, also found in the Philippines; it is only used as fuel ; it is called Gumudu in Telugu and Gattademmata in Ceylon.

PREMNA. LINN.

For Gen. Char. see letter-press to Pl. ccli.

1. PREMNA TOMENTOSA, *Willd.*—For description, &c. see Pl. ccli.

2. PREMNA SERRATIFOLIA, *Linn.*—A small tree, the trunk and older branches armed with opposite spines, branchlets panicles and petioles pubescent or glabrous, leaves short petioled ovate or oval-oblong, 2-4 inches long obtuse or acuminate, rounded towards the base, entire or with a few coarse obtuse teeth, quite glabrous in age, flowers small greenish yellow in dense terminal trichotomous cymes or corymbose panicles, slightly viscid and emitting a heavy disagreeable smell, calyx truncate or somewhat bilabiate, tube of the corol twice as long as the calyx, stamens slightly exserted. *Linn. Mant.* ii. *p.* 253. P. integrifolia, *Linn. l. c.* ; *DC. Prod.* xi. 632 ; *Wight Icones tab.* 1469.

Common throughout the plains of India, generally near the coast, also in Ceylon and Malacca ; wood used as firewood and for various purposes by the natives ; called Middee in Ceylon ; the root is used medicinally.

3. PREMNA LATIFOLIA, *Roxb.*—A small tree, leaves subcoriaceous round-cordate or oval entire or obsoletely repand obtuse or slightly acute, a little downy or glabrous in age except the veins, pale beneath, generally about 2½ inches each way, petioles round ½ to 1 inch long, panicles corymbose axillary and terminal many-flowered, flowers dirty-yellow, bracts minute caducous, calyx campanulate unequally 5-toothed, corol throat wooly, upper lip 3-cleft the under one emarginate, anthers bluish scarcely exserted, drupe size of a pea. *Roxb. Fl. Ind.* iii. 76 ;—*DC. Prod.* xi. *p* 635.

Not uncommon throughout the peninsula and in Ceylon, generally near the coast ; called in Telugu Pedda nella kura, and in Ceylon Middee : it is perhaps only a variety of the last species. The wood is white and firm and used for various purposes ; the leaves, which have a strong but not disagreeable smell, are much used in curries by the natives.

4. PREMNA CORDIFOLIA, *Roxb.*—A shrub about 6 feet high, branchlets cymes and petioles of the younger leaves villous, leaves short petioled cordate or cordato-ovate acuminate entire bullate, glabrous on both sides, shining above dull and pale beneath, 3-6 inches long, panicles terminal small contracted corymbose, flowers greenish-yellow, calyx cup-shaped 2-lipped both lips roundish entire, corol bilabiate about the length of the calyx-tube, upper lip rounded entire concave, lower 3-lobed, the middle lobe larger, throat densely villous, stamens and style about as long as the corol, drupe the size of a pea. *Roxb. Fl. Ind.* iii. 78 ;—*Wight Icones tab.* 1483.

Coimbatore, Madura, S. Arcot, and elsewhere in the plains of the peninsula.

5. PREMNA GLABERRIMA, *Wight.*—A shrub 5-6 feet high, everywhere glabrous except the inflorescence, leaves petioled ovate oblong or obovate abruptly acuminate entire or toothed membranaceous or subcoriaceous, somewhat shining above, pale whitish beneath, up to 8 inches long by 2½ broad, panicles terminal lax corymbose, ultimate divisions dichotomously cymose, calyx campanulate

obscurely 5-toothed shortly villous, corol bilabiate, upper lip emarginate, under 3-lobed, middle lobe the largest, throat hairy, stamens didynamous the larger pair exserted, style length of the longer stamens subclavate 2-cleft at the apex. *Wight Icones tab.* 1484.

Tinnevelly mountains ; the leaves are often serrated.

6. PREMNA WIGHTIANA, *Schauer.*—A large shrub or small tree, branchlets, cymes and petioles pubescent, leaves petioled ovate abruptly acuminate rounded or slightly attenuated at the base, entire or shortly toothed anteriorly, sub-bullate, glabrous on both sides membranaceous, about 3 inches long, panicles terminal thyrsoid, calyx sub-bilabiate unequally 5-toothed, tube of the bilabiate corol twice the length of the calyx, throat closed with hairs, putamen of the drupe pear-shaped verrucoso-tuberculate. *DC. Prod.* xi. 635 ;—*Wight Icones tab.* 1485.

Common about the southern parts of the peninsula up to about 3000 feet elevation.

7. PREMNA PURPURASCENS, *Thw.*—A scandent species (Anamallays, Wynaad, Ceylon.)—8. PREMNA HERBACEA, a small medicinal herb (Mudumallay, Travancore (Cardamom Hills), Ceylon).—9. PREMNA PROCUMBENS, an undershrub (Ceylon).

CALLICARPA. LINN.

Gen. Char. Calyx truncate or 4-rarely 5-toothed. Corolla with a short tube, the limb spreading, of 4, rarely 5 lobes, nearly equal. Stamens 4, rarely 5, shortly exserted. Ovary 4-celled with 1 ovule in each cell, laterally attached at or above the middle ; style filiform, dilated and truncate or very shortly 2-lobed. Fruit a small succulent drupe, the endocarp of 4 distinct 1-seeded nuts or pyrenes. Seed without albumen. Trees or shrubs, more or less cottony or woolly with stellate hairs or rarely glabrous, and often with numerous resinous glandular dots, especially on the under side of the leaves. Leaves opposite, undivided. Flowers small, in axillary cymes, with very small bracts.

1. CALLICARPA LANATA, *Linn.*—A middling sized tree, all the young parts more or less mealy, young shoots bluntly 4-sided or nearly terete, leaves opposite ovate oval or elliptic with a long acumination entire or slightly serrated, more or less downy underneath with a dense white tomentum above, sometimes nearly glabrous in age except the veins, 9-15 inches long by 4-6 broad, petioles 2-3 inches long, corymbs axillary erect 2-forked throughout, more or less covered with downy farina, bracts small purple or red, calyx truncate short quite entire or more or less 4-toothed, corol twice as long as the calyx. *Linn. Sp. Pl. ed. Willd.* i. 620 ;—*Roxb. Fl. Ind.* i. 391. Tomex tomentosa, *Fl. Zey.* 59. C. Wallichiana, *Walps. Rep.* iv. 125 ;—*DC. Prod.* xi. 641.

This tree is common in hill forests throughout the presidency and in Ceylon up to 4000 feet elevation ; its wood is white and spongy and of no use. The leaves are entire and slightly serrated on the same tree. We have, I believe, only one species though it differs much in the amount of the mealy pubescence and shape of the leaves ; one variety from the Orissa mountains (Russelcondah) has much less pubescence than the southern forms, and the leaves are quite elliptic, tapering equally at both ends (6-8 inches long, without the petiole, by 3-4 broad.)

Analysis, Pl. XXI, fig. 6.

(Under Walper's name Wallichiana, which should be corrected to C. lanata, *L.*)

1. A small portion of a corymb.
2. A flower bud.
3. A full flower.
4. A flower opened.
5. Calyx opened, ovary, style and stigma.
6. An anther, front view.
7. An anther, back view.
8. Ovary cut vertically.
9. Ovary cut transversely.
10. Portion of a corymb in fruit. (Drawn from dried specimens collected on the Pulney Hills ; the calyx is much more toothed than usual, it is generally truncate and quite entire).

CLERODENDRON. LINN.

Gen. Char. Calyx campanulate or inflated, 5-toothed or 5-lobed, generally enlarged and spreading under the fruit. Corolla-tube slender, often very long ; limb spreading, nearly equally 5-lobed. Stamens 4, exserted and often very long. Ovary 4-celled, with 1 ovule in each cell, laterally attached at or above the middle. Style filiform, with 2 short acute stigmatic lobes. Fruit a more or less succulent or almost dry drupe, the endocarp separating into 4 one-celled or rarely into 2 two-celled pyrenes. Trees or shrubs or rarely herbs or woody climbers. Leaves opposite or in whorls. Flowers in loose heads or cymes, usually forming terminal corymbose or thyrsoid panicles, or rarely axillary.

1. CLERODENDRON INFORTUNATUM, *L.*—A large shrub, branchlets quadrangular and like the branches of the panicles, petioles and nerves of the leaves whitish strigoso-tomentose, leaves long petioled roundish or ovato-cordate, or the upper ones ovate or even attenuated at the base not at all cordate, entire or shortly and sharply toothed, strigose on both sides ; panicles terminal spreading large naked, cymes laxly flowered, bracteoles caducous, flowers white, calyx strigoso-pubescent 5-nerved ventricose at the base squamato-glandulose 5-parted, segments lanceolate slenderly acuminate, corol strigoso-villous and glanduloso-punctate many times longer than the tube of the calyx, segments of the limb sub-unguiculate sub-recurved 3 times shorter than the tube, berries purple. *Linn. Fl. Zey. p.* 232 ;—*DC. Prod.* xv, 667 ;—*Wight Icones tab.* 1471.

A common shrub or undershrub found throughout India and Ceylon up to 5-6000 feet elevation, also in Birmah and Penang; in Ceylon it is called Gas-pinna.

Analysis, Pl. XXII, fig. 1.

1. Portion of the inflorescence.
2. A corol opened, showing the insertion of the stamens.
3. Calyx opened, shewing ovary, style and stigma.
4. Anthers, front and back view.
5. Ovary cut vertically.
6. Ovary cut transversely.

2. CLERODENDRON PHLOMOIDES, *Linn.*—A shrub 6-10 feet in height, branchlets terete and like the petioles and peduncles whitish tomentose, leaves membranaceous opposite petioled ovate or ovato rhomboid acuminate somewhat obtuse entire at both ends, irregularly and bluntly serrated in the middle, glabrous above puberulous beneath, panicles terminal large fastigiate leafy below, cymes trichotomous lax, bracteoles oblong, flowers white, calyx glabrous campanulato-ventricose half 5-cleft, segments subovate acute, tube of the corol subglandulose thrice the length of the calyx. *Linn. Suppl. p.* 292;—*DC. Prod.* xv. 663;—*Wight Icones tab.* 1473.

A common shrub all over the peninsula.

3. CLERODENDRON INERME, *Br.*—A glabrous shrub, or when young slightly pubescent, leaves stalked ovate obtuse or shortly acuminate entire, 1-3 inches long, preduncles axillary often nearly as long as the leaves, bearing 3 pedicellate flowers, calyx truncate not 2 lines long when in flower, above 3 when in fruit, corol-tube slender about 1 inch long, lobes about 4 lines, stamens much longer, drupe ovoid about twice as long as the calyx. *DC. Prod.* xi. 660.

A common shrub throughout India along the sea coasts, also in the Archipelago and the Islands of the Pacific; called in Ceylon Wall gooranda.

4. CLERODENDRON SERRATUM, *Spr.*; 5. C. SIPHONANTHUS, *R. Br.*, are undershrubs found in our forests; and 6. C. LINNÆI, *Thw.*, is a scandent species found in Ceylon.

TECTONA. LINN.

For Gen. Char. see letter-press to Pl. ccl.

1. TECTONA GRANDIS, *L.*—For description, &c. see Pl. ccl.

AVICENNIA. LINN.

Gen. Char. Calyx divided to the base into 5 distinct segments or sepals. Corolla-tube short and broad; limb of 4 nearly equal spreading lobes or the upper one rather larger. Stamens 4, inserted in the throat, with the anthers slightly protruding. Ovary 1-celled, with 4 ovules collaterally suspended from a central column, which has 4 angles between the ovules, imperfectly dividing the ovary into 4 cells. Fruit a compressed capsule, the pericarp opening in 2 valves. Seed solitary, erect, without integuments, (the integuments of the ovule not developed); embryo with 2 very large cotyledons folded longitudinally, a very hairy radicle, and a prominent plumula, which germinates before the fruit drops off as in *Rhizophora*, &c. Shrubs, leaves opposite, undivided. Flowers in small cymes in the upper axils or in terminal panicles. *Linn.*;—*Benth. Fl. Aust.* v. *p.* 69.

1. AVICENNIA OFFICINALIS, *Linn.*—An erect shrub, varying much in height, the branches, inflorescence and underside of the leaves white or silvery with a very close tomentum, more silky on the flowers, the upper side of the leaves usually glabrous when full grown, black and shining when dry. Leaves coriaceous, usually lanceolate or ovate-lanceolate, 2 to 3 inches long, acute and contracted into a petiole, but varying to elliptical or obovate and very obtuse. Cymes contracted into small heads on rigid angular peduncles, which are often 2 together in the upper axils or several in a small terminal leafy thyrsus. Bracts shorter than the sepals. Sepals orbicular or broadly ovate, concave, hirsute and ciliate, about 1¼ line long. Corolla-tube shorter than the sepals, lobes ovate rather longer than the tube, the upper inner one rather larger than the others Ovary very hairy.—A. tomentosa, *Jacq.*;—*R. Br. Prod.* 518; *Schau. in DC. Prod.* xi. 699;—*Wall. Pl. As. Rar. t.* 271;—*Wight Ic. t.* 1481;—*Benth. Fl. Aust.* v. 70.

This small tree or shrub is met with in the tidal backwaters near the coast throughout India and in Africa, America and Australia; the bark is used for tanning. A preparation made from the ashes of its wood is used by dhobies for washing cotton cloths, and by painters to mix with their colors to make them adhere.

Analysis, Pl. XXII, fig. 2.

1. A flower.
2. Corol open, shewing the 4 stamens.
3. A stamen.
4. Ovary, style and stigma.
5. Transverse section of the ovary.
6. Vertical section of the ovary 1-celled, with 4 ovules collaterally suspended from a central column. (Drawn from dried specimens.)

SUB CLASS III—MONOCHLAMYDEÆ.

ORDER LX—NYCTAGINEÆ.

Perianth simple, inferior, the lower portion persistent and enclosing the ovary and fruit, the upper portion variously shaped, with 5 rarely 4 angles, folds, teeth or lobes, deciduous or withering. Stamens either of the same number as the folds or teeth of the perianth or fewer or more, often inconstant in the same species, and never more than 20, inserted on (or united at the base with) a narrow or cupshaped disk more or less adnate to the stipes of the ovary within the perianth (or rarely free from the base ?); filaments slender usually exserted; anthers 2-celled, the cells attached back to back and opening longitudinally round the outer margin. Ovary shortly stipitate within the base of the perianth, 1-celled, with 1 erect anatropous ovule. Style terminal, simple, undivided, with a single stigma. Fruit 1-seeded, enclosed in the persistent tough or hardened base of the perianth which falls off with it, having the appearance of a pericarp, the real pericarp thin and membranous more or less adherent to and often inseparable from the equally thin testa of the seed. Embryo curved transversely folded or longitudinally convolute around or within a mealy albumen, radicle inferior. Herbs, shrubs or trees, the nodes often tumid and articulated. Leaves usually opposite, often unequal in each pair, rarely alternate, usually entire or scarcely sinuate. Flowers solitary clustered or umbellate, the bracts often forming an involucre round them, sometimes large and coloured, but often small.

An order of no importance to the forester. Besides the Pisonia aculeata, a climbing or straggling shrub, it is only represented in S. India by the genus Boerhaavia, which yields 2 or 3 small herbaceous plants. Of introduced plants Pisonia morindifolia (the Lettuce tree) and the beautiful Bugainvilleæ (creepers), and the Mirabilis (Marvel of Peru) are common in our gardens.

PISONIA. LINN.

Gen. Char. Flowers hermaphrodite or unisexual. Perianth in the hermaphrodite flowers contracted above the ovary, in the males campanulate, in the females ovoid or cylindrical, the margin in all 5-angled or 5-toothed. Stamens usually 6 to 8 longer than the perianth, none in the female flowers. Ovary entirely wanting or imperfect in the male flowers Stigma in the females dilated, oblique. Fruiting perianth oblong or elongated, 5-ribbed, smooth or glandular-muricate, crowned by the small withered limb of the perianth. Seed oblong with a deep longitudinal furrow. Albumen scanty. Embryo straight, the cotyledons convolute over the intruded testa. Trees, shrubs or woody climbers. Leaves opposite or scattered. Flowers in dense or loose cymes, often arranged in terminal panicles. Bracts and bracteoles very small or none.

1. PISONIA ACULEATA, *Linn.*—A tall woody climber, forming impenetrable masses on the borders of forests reduced to a low straggling bush in open places, glabrous or rarely pubescent; often armed with stout recurved axillary prickles (abortive peduncles). Leaves opposite or here and there alternate, petiolate, ovate, often broad, or rarely oblong or lanceolate obtuse, entire, rarely exceeding 3 inches and often all under 2 inches long. Flowers diœcious, in small dense cymes or globular clusters, of which several are usually collected into small panicles in the upper axils, the common peduncle rarely exceeding the leaves and often very short. Male perianths shortly pedicellate, campanulate, shortly and broadly 5-toothed, the bud clavate and prominently 4-angled at the top, opening to about 2 lines diameter. Female perianths nearly sessile, ovoid, about 1 line long, obscurely 5-toothed, enclosing the ovary, the style shortly protruding, with a deeply lobed or fringed stigma. Fruit in loose cymes forming often large panicles, the pedicels lengthening to above ½ inch, the enlarged perianth oblong or linear-clavate, ¼ to ½ inch long, 5-ribbed, glandular muricate. *Wight Ic. t.* 1763, 1764. P. villosa, *Poir.*;—*Chois. in DC. Prod.* xiii. 11. 440. P. limonella, *Blume*;—*Chois. l. c.* 446;—*Benth. Fl. Aust.* v. 279.

A common shrub throughout India and Ceylon up to 3000 feet elevation; it is also found throughout the tropical regions of the new and old world.

Analysis, Pl. XXII, fig. 3.

1. A male flower bud.
2, 3. Full male flowers.
4. The calyx of male flower.
5. Anther, front view.
6. Anther, back view.
7. Stamens and abortive ovary.
8, 9. Abortive ovary cut vertically and horizontally.
10. A female flower.
11. Female flower, opened disk, ovary, style and 3-cleft stigma.
12. Ovary cut vertically, 1 cell, 1 erect ovule.
13. Ovary cut transversely.
14. Fruit.
15. Fruit opened, exposing the seed.
16. Vertical section of seed, the cotyledons convolute over the intruded testa.
17. The embryo removed. (Drawn from living flowers.)

ORDER LXI—MYRISTICEÆ.

Flowers diœcious, regular. Perianth deciduous, 3-lobed or rarely 2 or 4-lobed, the lobes valvate in the bud. Male flower: Stamens united in a central column, anthers 3, 6, or more adnate to the column at the apex, or in a ring immediately below the column, each with 2 parallel cells opening longitudinally. Female flower: Ovary free within the perianth, with a single erect anatropous ovule; stigma sessile or nearly so, capitate or depressed. Fruit succulent, opening tardily in 2 valves. Seed erect, sessile, more or less covered with a lobed or jagged often scarlet arillus (arillodium) proceeding from the base of the seed. Albumen remarkably ruminate. Embryo very small, at the base of the seed, with divaricate cotyledons. Trees, often aromatic. Leaves alternate, entire, usually

dotted, penniveined, without stipules. Flowers small, in axillary or supra-axillary racemes or panicles, more numerous in the males than in the females. Bracts minute or none

This order is limited to the genus Myristica (which yields the Nutmeg of commerce) In this presidency we have 5 species, all large trees, confined to our moist western forests , all of these I have figured A 6th species, M ATTENUATA, *inhabits the Bombay ghats, and will probably also be found in Canara and Mysore , and 2 others,* M. HORSFIELDIA *and* M IRYA, *are found in Ceylon The timber of several of our Indian species appears to be of fine quality, but it has never been tried The order should receive the attention of forest officers.* MYRISTICA MOSCHATA *(the true nutmeg) is very common in cultivation on the west side of the Presidency and on the Tinnevelly mountains*

MYRISTICA. LINN

Gen. Char the same as that of the order.

1. MYRISTICA LAURIFOLIA, *H. f. et T.*—For description, &c see Pl cclxvii.

2. MYRISTICA MAGNIFICA, *Bedd*—For description, &c. see Pl cclxviii.

3. MYRISTICA MALABARICA, *Linn.*—For description, &c. see Pl cclxix.

4 MYRISTICA FARQUHARIANA, *Wall.*—For description, &c. see Pl cclxx.

5. MYRISTICA CORTICOSA, *Lour.*—For description, &c see Pl. cclxxi.

6. MYRISTICA ATTENUATA, *Wall.*—A tall tree, branches slightly scurfy, leaves membranaceous oblongo-lanceolate long attenuated, acute or rounded at the base, sub furfuraceous on the costa and veins, glabrescent in age, glaucous beneath, 5 8 inches long by 1¾ 2¼ inches broad ; the lateral veins 12 20 on each side, petioles 5 6 lines long, peduncles axillary 3 4 flowered, pedicels longer than the peduncle bracteolate at the apex, perianth subglobose laxly tomentose, antheriferous disk flat surrounded by 12 anthers, fruit oval or oblong fulvo tomentose, 1½ inch long, aril thin. *Wall List.* 6791 ,—*H. f. et T. Fl. Ind. p.* 157.

On the Concan ghats in Bombay. The section *Knema*, to which this and M corticosa belong, is well distinguished from the rest of the genus (except M. Irya, in which the disk is concave) by the staminal column being dilated at the apex into a flat disk round which the anthers are placed , it is made a separate genus by some. I have not seen this species, and it is perhaps not distinct from No 5

7 MYRISTICA HORSFIELDII, *Bl* —A very large tree, young branches densely tomentose, young parts floccoso-tomentose, leaves ovato-oblong acuminate, glabrous above, beneath stellato-pubescent, 6-9 inches long by 2⅓-3½ inches broad, panicles axillary the male 3 6 inches long branched, the branches alternate bearing 3-5 subsessile heads, the female generally much shorter simple densely furfuraceo-tomentose, flowers very fragrant , *the male* densely glomerate sessile obconical, perianth 3 4 parted, anthers 6 adnate to the slender column which is clavate at the apex, the connective not produced beyond the apex , *the female* lax subsessile swollen at the base, ovary tomentose, stigma sessile undivided, fruit ovoid ferrugineo-tomentose, aril fleshy complete undivided. *Bl Bijd.* 577 ,—*H fil et T Flora Ind* 163. Pyrrhosia Horsfieldii, *Wight Icones tab* 1857 Myristica Iryaghedhi, *Gærtn* i *t* 41, *exparte.* Horsfieldia odorata, *Willd. Sp* iv 872. M Irinagedi, *Spr. Syst. fig.* iii. 65; M ferruginea, *Wall. cat* 6803.

Ceylon, abundant in the Ambagamwa and Ratnapoora districts up to 1000 feet elevation, called Rook , the fragrant flowers are used by the natives as a perfume for scenting their clothes.

8 MYRISTICA IRYA, *Gærtn.*—A large tree, young parts slightly puberulous, leaves variable in form, oblong or linear-oblong rounded or acute at the base, glabrous on both sides, 5-10 inches long by 1½ 2½ inches broad, petiole ⅓ ⅔ inch long, panicles from the old axils much branched 3 6 inches long, bracts ovate glanduloso punctate deciduous, flowers minute glabrous, perianth 2-3 parted glabrous, staminal column pyriform concave at the apex antheriferous round the margin, anthers 6 8 Stigma depressed entire or scarcely lobate, fruit globose nearly 1 inch in diameter granuloso-tuberculate but glabrous, valves thick coriaceous reddish and glabrous on the inside, aril complete thin fleshy scarlet, seed globose, hilum small. *Gærtn. Fruct* i 195 *t* 41 ;—*H f. et T. Fl Ind.* 159. M Javanica, *Bl. Bijd.* 576. M sphærocarpa, *Wall. Pl. As. Rar.* i *t* 89. M exaltata, *Wall. cat* 6804 *partim*

Ceylon, common in damp places up to 2000 feet elevation, called Irya , also found in Birmah, Java and Borneo. This belongs to the section *Irya*, distinguished by its staminal column being dilated into a concave disk.

ORDER LXII—MONIMIACEÆ.

Perianth regular, usually at first globular or nearly so and more or less adnate to or continuous with the expanded receptacle or staminal disk, the limb of 4 or more connivent lobes or segments in 2 or rarely more rows but all of similar texture, calycine or scarcely petaloid, deciduous or persistent. Stamens either definite and opposite the perianth-segments or more frequently indefinite and irregularly arranged in several rows , filaments very short , anthers adnate, usually extrorse, the cells opening in separate valves or in longitudinal slits, either distinct or confluent at the apex. Gynæcium of several carpels free and distinct rarely reduced to a single one, each with a single ascending or pendulous antropous ovule, style terminal usually oblique excentrical or almost lateral, filiform or very short or almost none, with a small or pulvinate terminal stigma. Fruit of several (or rarely only one) 1 seeded drupes or nuts, resting on the expanded receptacle or persistent portion of the perianth tube or enclosed in the enlarged perianth Seed with a membranous testa and fleshy albumen. Embryo usually very small, with divaricate or appressed cotyledons and a short or long radicle next the hilum Trees, shrubs or woody climbers, usually glandular dotted and aromatic. Leaves opposite entire or toothed without stipules Flowers solitary or in trichotomous cymes or definite raceme-like or thyrsoid panicles, axillary or rarely terminal. Bracts usually very small.

This order is only represented by the genus Hortonia, which yields a shrub or small tree only as yet detected in Ceylon

HORTONIA. WIGHT.

Gen. Char. Flowers hermathrodite or polygamous, sepals about 30 in many series imbricate slightly cohering at the base, the exterior ones thickish rounded, the interior longer and thinner, the innermost ligulate acute. Stamens 7-10 in a single series at the margin of the torus, filaments cylindrical furnished at the base with 2 large cucullate stipitate glands, anthers extrorse adnate broadly oval 2-celled, dehiscing longitudinally, ovaries few or indefinite oblong or ovoid-oblong attenuated into a simple style, stigma dilated, ovule solitary pendulous, drupe obovoid compressed attenuated into a stipe at the base, putamen smooth fragile, seed pendulous, testa thin, chalaza large basal, raphe marginal conspicuous, albumen copious fleshy, embryo minute included in the albumen, cotyledons oval obtuse divaricate, radicle superior. Shrubs or small trees, leaves opposite entire, inflorescence cymose axillary, flowers yellowish. *Wight et Arnt. in Ann. Zool. Bot. 2 p. 545.*

1. HORTONIA FLORIBUNDA, *Wight.*—A small tree or shrub, young parts stellately puberulous, leaves petioled from oval obtuse to oblongo or ovato or linear-lanceolate acuminate coriaceous entire penniveined glabrous, 3-7 inches long by ½-2½ broad, petioles ½-⅔ inch long, peduncles axillary 1-3 inches long cymose, few flowered, flowers rarely reduced to only 1, pale yellowish green very variable in size, sometimes polygamous, exterior leaves of the perianth and pedicels minutely stellato-puberulous. *Wight. l. c.* Hortonia floribunda, ovalifolia et acuminata, *Wight Icones. tab.* 1997, 1998.

Ceylon, from the sea level up to 6000 feet, called Waraweya; a very variable plant. The lower level form (common at Badagam) has narrower leaves and much smaller flowers, and is sometimes polygamous with very small effete ovaries.

Analysis, Pl. XXV, fig. 3.

1. Branch in flower.
2. Flower, underneath view.
3. Flower, front view.
4. A stamen and the glands. (Drawn from flowers in spirits collected near Galle in Ceylon.
5. Ovaries.
6. An ovary removed.
7. Vertical section of ovary.
8. Branch of fruit.

9—11. Analysis of fruit, seed and embryo. (From drawings communicated by Dr. Thwaites.)

ORDER LXIII—PROTEACEÆ.

Flowers hermaphrodite or rarely partially unisexual. Perianth regular or irregular, deciduous, consisting of 4 segments valvately united in the bud, the claws forming a tube cylindrical or dilated towards the base, the laminæ short, forming a globular ovoid or rarely elongated limb; the segments at length separating either from the base upwards or revolute from the lamina downwards, leaving a portion of the tube entire or open on one side, the laminæ sometimes cohering long after the segments have separated lower down. Stamens 4, opposite the perianth-segments and usually inserted on them, either with the filaments wholly adnate leaving the anthers sessile at the base of the laminæ, or the filaments shortly free below the laminæ, or very rarely the stamens entirely free from the perianth; anthers various all perfect or rarely partially abortive, most frequently with 2 parallel cells adnate to a connectivum continuous with the filament. Hypogynous or perigynous glands or scales in many genera 4, alternating with the stamens, but in some genera variously united or reduced in number or wholly deficient. Ovary 1-celled, sessile or stipitate, more or less excentrical, with a single terminal undivided style variously shaped at the end, with a small terminal oblique or lateral stigma. Ovules either solitary or 2 collaterally attached or slightly superposed, or several imbricate in 2 contiguous rows, either pendulous and orthotropous, or more frequently laterally attached and more or less amphitropous, rarely erect and anatropous, the micropyle always inferior and frequently prominent from the incomplete development of the primine. Fruit either an indehiscent nut or drupe, or a more or less dehiscent coriaceous or woody follicle, very rarely a completely 2-valved capsule; either 1-celled and 1-seeded, or when 2 seeds are ripened in a drupe, sometimes really 2-celled from the growth of the endocarp between as well as round the seeds, or when 2 or more seeds ripen in a follicle, apparently 2- or more-celled by the consolidation of the external coating of the 2 adjoining seeds into a membranous or woody plate detaching itself from the remainder of the seed. Seeds without albumen, the testa usually thin rarely coriaceous or hard; embryo straight, with fleshy cotyledons and a short inferior radicle. Shrubs or trees, rarely undershrubs or even perennial herbs. Leaves alternate or scattered, in a very few genera strictly opposite or verticellate, but often crowded under the inflorescence so as to appear verticellate, usually coriaceous, often vertical with stomata on both sides, or in the same genera horizontal or narrow and teete, entire toothed or variously divided, without stipules. Flowers axillary or terminal, solitary or in racemes or spikes, often condensed into umbels, heads or cones, each flower or pair of flowers subtended by a bract, very deciduous in some genera and perhaps sometimes really deficient.

A very large Australian and South African order, but it is not one of any importance to the Indian forester; the only genus represented in S. India is Helicia, and this yields 2 small trees, one on the Tinnevelly ghats and one in Ceylon, both at elevations between 2000 and 4000 feet, and one shrub (slopes of the Nilgiris, 3-4000 feet.)

Numerous species of Hakea, and several species of Grevillea and Banksia, introductions from Australia, are growing admirably in our gardens at Ootacamund, and I am endeavouring to introduce more plants of this interesting order, as they will probably all thrive well on the Nilgiris. Grevillea robusta and Stenocarpus salignus are thriving well at Madras and Ootacamund (i.e., sea level and 7000 feet), the former of these two is a very valuable introduction as an ornamental tree, and it might be largely planted at most stations. Leucodendron argenteum, the Silver Tree of the Cape, has been introduced and grows well on our mountain ranges, the beautiful Telopea speciossisima (the Waratau of New South Wales), and the splendid Cape Proteas are desirable introductions for our mountain gardens.

Tribe Grevilleæ.—Ovules 2-4, seeds without any intervening substances or separated by a thin lamina or mealy substance. Flowers in racemes or clusters with deciduous or abortive bracts, or with an involucre of imbricate bracts.

Ovules 2 ascending, perianth regular or nearly so, leaves alternate, fruit with a thick woody indehiscent pericarp or putamen ..... HELICIA.

HELICIA. LOUR.

For Gen. Char. see letter-press to Pl. ccci.

1. HELICIA ROBUSTA, *Wall.*—For description, &c. see Pl. ccci.

2. HELICIA NILAGIRICA, *Bedd. Mad. Journ. of Lit. July* 1864 (cum. fig).—A shrub, glabrous, leaves broad ovate elliptic or lanceolate acute attenuated at the base coarsely and sharply dentate with large sinuses except at the very base, prominently veined and reticulated sub membranaceous, racemes much shorter than the leaves, peduncles very short, each bearing 2 pedicels 3-6 lines in length, a bract at the base of the peduncle and a bracteole on each pedicel near its base, fruit 5 lines in diameter.

Western slopes of the Nilgiris 3-4000 feet elevation abundant. This differs from the last in being only a shrub and in the leaves being petioled and acute at the base and much more membranaceous, the fruit is also much smaller.

3. HELICIA CEYLANICA, *Gardn.*—A middling sized glabrous tree, peduncles and pedicels purplish, leaves rather coriaceous entire oblongo or obovato-elliptic obtuse attenuated into a short petiole, veins prominent on both sides slender laxly reticulated, 4-5 inches long by 1¼-2 inches broad, petioles about ½ an inch long, racemes axillary solitary subsessile about equalling the leaves laxly flowered, pedicels slender 3-4 lines long from a very short peduncle, calyx glabrous 8-9 lines long a little swollen at the base, ovary glabrous, hypogynous glands obtuse semicuneate, flowers pale yellow, fruit ovoid slightly acuminate at both ends, blackish purple about 1 inch long. *Gardn. Calc. Journ of Bot. vol.* vii. *p.* 453 ;—*DC. Prod.* xiv. *p.* 438 ;—*Thw. En. Pl. Zey. p.* 250.

Ceylon, central provinces, 2000-4000 feet elevation.

ORDER LXIV—THYMELÆACEÆ.

Flowers hermathrodite or rarely unisexual, polygamo-diæcious, 4-or rarely 5-merous. Calyx inferior, corolla-like or rarely herbaceous gamosepalous, tubular, funnel-shaped, campanulate, or urceolate, deciduous or marcescent, tube continuous or articulately breaking above the base with the base persistent in fruit, lobes 4-5 imbricate with often the addition of 1-2 small scales alternating with the lobes at their base connivent or spreading, scales hypogynous, 4-8, small membranaceous fleshy or filiform, placed round the ovary, free or connate into a ring or cup or adnate to the calyx, rarely obsolete or wanting. Stamens 2-4, 4-5 or 8-15, generally in 2 series when double as many as the lobes of the calyx, inserted into the jaws or on the tube, filaments filiform or flat adnate to the tube or throat or base of the lobes, included or exserted, anthers 2-celled oval oblong or linear affixed by the base or back erect or versatile dehiscing longitudinally, ovary free 1-2 celled, ovule 1 solitary pendulous or 2-3 collateral or superposed, style simple lateral or terminal filiform deciduous or often very short or wanting, stigma capitate sphœroid or subclavate, papillose or rarely smooth, fruit indehiscent, nucamentaceous drupaceous or baccaceous, 1-rarely 2-celled, cells 1-rarely 2-3 seeded or (in Gyrinops and Aquilaria only) a capsule opening loculicidally in 2 flat valves with the narrow dissepiment in their centre, seed without or with albumen, embryo straight with a superior radicle. Trees, shrubs or climbers or rarely herbs, leaves simple and entire alternate or opposite without stipules, flowers in terminal or axillary clusters, heads, umbels, racemes or spikes.

Not an order of any importance to the forester ; it is only represented in this Presidency by one large shrub or small tree (Lasiosiphon eriocephalus) which is common on the mountains on the west side of the presidency, and by one climber (Canejera Rheedii). In Ceylon the genera Gyrinops and Phaleria each yield 1 small tree, and Wikstrœmia a shrub ; but these 3 genera have not yet been detected in the peninsula.

In East Bengal the genus AQUILARIA *yields a large tree, and the genus* LINOSTOMA *a shrub, and the genus* DAPHNE *is represented by 5 shrubs in Northern Bengal, the Himalayas, Khasya, Sylhet, &c.*

SUB ORDER THYMELEÆ.—Ovary 1-celled, ovule solitary.

Stamens twice as many as calyx-lobes.					
Calyx 4-lobed	....	.....	....	.....	WIKSTRÆMIA.
Calyx 5-lobed	.....	.....	.....	.....	LASIOSIPHON.
Stamens equal in number to calyx-lobes		.....	.....	.....	CANEJERA.

SUB ORDER AQUILARINEÆ.—Ovary 2-celled, cells 1-ovuled (or 1-celled placentas 2 parietal.)

Calyx 5-lobed, anthers sessile	.....	.....	.....	GYRINOPS.
Calyx 4-lobed, anthers with filaments	.....	.....	.....	PHALERIA.

WIKSTRÆMIA. ENDL.

Gen. Char. Calyx or perianth with a spreading 4-lobed limb without scales at the throat, anthers 8 in 2 rows near the top of the tube, perigynous scales none, hypogynous scales 4-5 or 2 small linear free or connate below, ovary 1-celled with 1-pendulous ovule, style terminal short or obsolete, stigma subcapitate, berry drupaceous, seed without albumen. Leaves opposite or alternate, flowers in short terminal or axillary racemes or spikes.

1. WIKSTRÆMIA VIRGATA, *Meisn.*—A shrub with twig-like branches, puberulous or tomentose at the top, leaves alternate herbaceous or subcoriaceous short petioled oblong or lanceolate sparingly adpressedly pilose or subglabrous, peduncles hairy tomentose terminal and from the upper axils shorter than the leaves, flowers shortly pedicellate racemoso-capitate hoary-tomentose, lobes of the calyx very short obtuse, tube 8-striated within, anthers on filaments nearly their own length, ovary stipitate pubescent, hypogynous scales 4-5 more or less connate. *Meisn.* ;—*DC. Prod.* xiv. 547. W. canescens et inamœna, *Meisn.* ;—*DC. l. c.* W. salicifolia, *Decaisne* ;—*DC. l. c.* Daphne inamœna, *Gard. in Calc. Journ. of Nat. Hist.* vii. *p.* 454.

Ceylon, central provinces, 6000-8000 feet elevation.

Analysis, Pl. XXV, fig. 4.

1. A branch in flower.
2. The calyx or perianth opened, lobes very short, tube 8-striated within, anthers on filaments nearly their own length.
3, 4. Stamens, front and back view.
5. Ovary and sessile stigma, and the linear hypogynous glands, 1 free, 4 connate.
6. Ovary cut vertically, shewing the single cell and 1 pendulous ovule (the ovary should be in a longer stipe). From a drawing communicated by Dr. Thwaites.

The genus is generally described as with sessile anthers, and this species as having 4 free hypogynous glands; in all the flowers I have dissected, I found Dr. Thwaites's analysis correct as to the filaments, and the hypogynous glands are all slightly connate at the base and all but 1 up to the apex.

LASIOSIPHON. Fresen.

Gen. Char. Flowers hermathrodite 5 merous. Calyx or perianth colored, pubescent outside, glabrous within, tube slender, limb 5-parted regular spreading. Scales 5-petaloid, inserted into the jaws of the tube at the sinus of the lobes alternate with the upper stamens, exserted glabrous entire or bifid, sometimes obsolete. Stamens 10 in a double row near the apex of the tube subsessile or with short filaments, anthers affixed near the base, linear or oblong obtuse, hypogynous ring membranaceous surrounding the ovary at the base small or obsolete, ovary sessile or stipitate, style equalling the calyx-tube, stigma capitate papillose, fruit included in the persistent base of the calyx. Seed sparingly albuminous. Shrubs or small trees, leaves scattered or opposite, flowers in terminal or subterminal heads usually many-flowered surrounded by a many-leaved involucre, receptacle hemispherical villous.—Enkleia, *Griff. in Calc. Journ. of Nat. Hist.* 4. *n.* 13. Gnidia, *Wight* (not *Linn.*)

1. Lasiosiphon eriocephalus, *Dcne.*—A large shrub or small tree up to 25 feet high, leaves alternate scattered, lanceolate acute to oblong obtuse glabrous, very shortly petioled, 2-3 inches long by ½-1 inch broad, the involucral ones nearly equaling the short peduncled or subsessile capitule, oblong hoary imbricate, calyx 5-10 lines long villous with long white or brown hairs. Scales linear obovate or obcordate. *Decaisne in Jacq. Voy. p.* 148;—*DC.* xiv. *p.* 597. L. speciosus, *Dcne. l. c.*;—*DC.* xiv. 598. L. Metzianus, *Miq.*;—*DC. l. c.* 598. L. insularis, *DC. l. c.* 598. L. Sisparensis, *DC. l. c.* 598. Gnidia eriocephalus and Sisparensis, *Wight Icones* 1859 & 60. Gnidia insularis, *Gardner* (and probably Lasiosiphon Hugelii, *DC.*)

This is very common on all the mountainous tracts of the western side of this Presidency and Bombay, generally on the outskirts of woods, up to an elevation of 5000 feet, also in Ceylon and N. Bengal; it is rather variable in the shape of the leaves and pubescence and shape of the perianth scales, and DeCandolle divides it into 5 or 6 species, but they all merge one into the other. The bark is used for poisoning fish in South Canara and Ceylon, and a very excellent fibre is made out of it; in Ceylon the plant is called Naha.

Analysis, Pl. XXV, fig. 2.

1. Portion of a branch in flower.
2. A flower bud.
3, 4. Full flowers.
5. Flower opened.
6. Ovary, style, and stigma.
7, 8. Anthers, front and back view.
9. Ovary cut vertically.
10. Ovary cut tranversely. (All drawn from living specimens collected on west slopes of Nilgiris, 4000 feet elevation.)

CANSJERA. Gmel.

Gen. Char. Calyx or perianth short deciduous with 4 small lobes spreading or recurved, without scales in the throat. Stamens 4 with slender filaments inserted at the base of the perianth, hypogynous scales 4 alternating with the stamens, ovary fleshy with a minute cavity, and 1 (or 2 or 3 when very young) pendulous ovule. Fruit a berry with a single erect seed, embryo small towards the summit of a fleshy albumen. Shrubby climbers, leaves alternate, flowers small in axillary spikes.

1. Cansjera Rheedii, *Gmel.*—A climbing shrub, young branches and inflorescence minutely pubescent or glabrous, leaves almost sessile ovate-acuminate or broadly lanceolate, 1½-2 inches long glabrous ever-green and rather thick. Spikes about 1 inch long. Flowers yellow, sessile, rather distant; perianth about 1½ lines long with 2 minute bracteoles at the base. *Gmel. in DC. Prod.* xiv. 519;—*Wight Icones tab.* 1861;—*Benth. Fl. Hong Kong* 296. C. lanceolata, *Benth. in London Journ. Bot.* i. 491.

This plant is common in hedges, &c., in the plains throughout the peninsula and Ceylon, also in the Archipelago and Hong-kong.

Analysis, Pl. XXVI, fig. 6.

1. Portion of a branch and spike of flowers.
2. Magnified portion of the spike.
3. A single flower.
4. Flower open.
5. Ovary, stigmas and the hypogynous glands.
6. Anther, front view.
7. Anther, back view.
8. Branch in young fruit, the remains of the hypogynous glands still visible.
9. Young fruit cut vertically, showing the single erect seed.

GYRINOPS. GÆRTN.

For Gen. Char. see letter-press to Pl. cccii.

1. GYRINOPS WALLA, *Gærtn.*—For description, &c. see Pl. cccii.

PHALERIA. JACK.

Gen. Char. Calyx colored, funnel-shaped, limb 4-cleft, lobes subequal, jaws naked, stamens 8 inserted near the summit of the tube, filaments exserted the alternate ones opposite the calyx-lobes longer, ovary sessile surrounded at the base with a cup-shaped disk, style terminal filiform exserted, stigma capitate papillose, drupe ovoid. Trees or shrubs, leaves opposite or alternate coriaceous short petioled, flowers in heads or umbels axillary terminal or cauline furnished with a common involucre. *Jack Malay Misc.* Drymispermum, *Reinw.*

1. PHALERIA CAULIFLORA, *Thw.*—A small elegant glabrous tree, branches elongate subpendulous, leaves shining oblongo-lanceolate with a longish acumination acute at the base, shortly petioled, 6-9 inches long by 1½-3½ inches broad, capitules cauline very shortly pedunculate, bracteoles ovate acute about 3 lines long, flowers white 8 lines long, calyx glabrous, lobes rounded obtuse villous at the margins, stamens in 2 series, filaments alternately slightly longer, fruit ovoid a little acuminate about the size of a nut fleshy red. —Drymispermum cauliflorum, *Thw. En. Pl. Zey. p.* 251.

Ceylon, Hewisi, on the banks of a stream.

Analysis.

1. Portion of a branch in leaf.
2. Flowers.
3. A flower open.
4. Stigma.
5. Bract or involucre-leaf.
6. View of an anther.
7. Ovary.
8. Vertical section of the same.
9. Transverse section of the same.
10—13. Analysis of the fruit. (From a drawing communicated by Dr. Thwaites.)

ORDER LXV—ELÆAGNACEÆ.

Perianth tubular, free but persistent at the base and contracted above the ovary, the upper portion deciduous 2-or 4-lobed Stamens equal to and alternate with the perianth-lobes or twice as many, inserted in the tube or at its base. Anthers 2-celled, opening longitudinally. Ovary 1-celled, with 1 erect ovule. Fruit indehiscent, usually succulent, enclosed in the persistent base of the perianth. Seed with a very thin or without albumen. Embryo straight, the radicle inferior. Trees or shrubs, more or less covered with scurfy stellate scales. Flowers in axillary clusters or cymes.

An order of no importance to the forester; it is only represented by a single species of Elæagnus, a small straggling tree or large shrub. In Northern India the genus Hippophae yields a small tree.

ELÆAGNUS. LINN.

Gen. Char. Flowers hermaphrodite. Perianth 4-lobed valvate in the bud. Stamens 4, inserted in the tube. Style subulate, recurved, and stigmatic along one side at the top.

1. ELÆAGNUS LATIFOLIA, *Linn.*—A straggling shrub or small tree, armed or unarmed, more or less densely rusty-scurfy, leaves elliptic or oblong, glabrous above, covered beneath with silvery or ferruginous scales, flowers axillary pedicelled or subsessile in dense heads or racemose or subsolitary, silvery and more or less scurfy, tube of calyx cylindric, limb 4-angular, fruit oblong succulent edible. *Linn.*;—*Wight Icones*, 1856. E. conferta, parvifolia et arborea, *Roxb.* E. ferruginea, *A. Rich.* E. Wallichiana, *Sch.* E. Thwaitesii, *Schl.* E. kologa, *Schl.*

A very variable plant, common almost throughout India and Ceylon up to 8000 feet; its fruit makes good tarts.

Analysis, Pl. XXV., fig. 1.

1. Portion of a branch in flower.
2, 3. Flowers.
4. Flower opened.
5, 6. Anthers, front and back view.
7. Vertical section of ovary.
8. Transverse section of ovary.
9. Fruit.
10. Vertical section of fruit.
11. Transverse section of fruit.
12—15. Seed and embryo.
16. Magnified portion of the under surface of the leaf.
17. Portion of a peduncle.
18. A magnified scale. (Partly from Dr. Wight's drawing, partly from living flowers.)

ORDER LXVI—SANTALACEÆ.

Flowers hermathrodite or diœcious. Perianth-tube wholly or partially adnate, the limb with 3 to 5 lobes or segments, valvate in the bud. Stamens as many as the lobes and opposite to them, inserted at their base or within the free part of the tube. Anthers 2-celled, opening longitudinally. Ovary inferior, 1-celled, with 3 to 5 ovules suspended from a free erect placenta. Fruit an indehiscent nut or berry, with a single seed. Albumen fleshy. Embryo straight with a superior radicle. Herbs or shrubs, rarely trees. Leaves alternate or rarely opposite, entire, without stipules. Flowers usually small and green, in terminal or lateral heads, cymes, or spikes.

This order yields the Sandalwood (Santalum album) so common in the hill tracts of Mysore, Salem and Coimbatore, but otherwise it is of no importance. Pyrularia Wallichiana, a small tree common in Coorg. and Osyris arborea, a shrub, are the only other trees or shrubs. Thesium Wightianum is a small suffruticose plant found on the Nilgiris. Henslowia is a genus found in N. India yielding one shrub.

Thorny—	
Flowers unisexual	PYRULARIA.
Unarmed—	
Flowers hermathrodite, stamens 4-5	SANTALUM.
Flowers unisexual, or female and hermathrodite, stamens 3	OSYRIS.

PYRULARIA. MICH.

For Gen. Char. see letter-press to Pl. cccIV.

1. PYRULARIA WALLICHIANA, *A. DC.*—For description, &c. see Pl. cccIV.

SANTALUM. LINN.

For Gen. Char. see letter-press to Pl. cclvi.

1. SANTALUM ALBUM, *Linn.*—For description, &c. see Pl. cclvi.

OSYRIS. LINN.

Gen. Char. Flowers unisexual, or male and hermathrodite, perianth-tube slender in the male flowers, obconical in the female, or hermathrodite, deeply 3-(4-) lobed, lobes ovate acute. Stamens 3 (4), filaments short, anthers 2-celled, disk concave, lobes round covering the upper and entire portion of the perianth, ovary fleshy inferior, style short, stigmas 3 (4) alternate with the lobes of the perianth, placenta straight very short bearing generally 3, sometimes 2-4 ovules at it apex, drupe ovoid globose crowned with the remains of the perianth-lobes and disk, seed filling the single cell, embryo oblique in the upper part of the copious albumen, radicle superior, cotyledons lanceolato-terete semi-incurved longer than the radicle. Shrubs or trees, branches angled, leaves alternate or rarely opposite. Male flowers congested at the apex of the peduncle. Female solitary or few.—Casia, *Cam. Lob., &c. Tourn. inst, p.* 664. Colpoon, *Berg. Pl. Cap. p.* 38.

1. OSYRIS ARBOREA, *Wall.*—A shrub, very ramous, everywhere glabrous, young shoots 3-sided with prominent sharp angles, leaves short petioled, from oblong elliptico lanceolate to elliptic obovate, mucronate, ½ 2 inches long 4-15 lines broad, perianth 3-lobed. *Male* flowers umbellato-capitulate, peduncles axillary and terminal shorter than the leaves, 6-8 flowered; *female*, peduncles axillary and terminal 1-3 flowered elongating in fruit, the anthers often polleniferous, ovary conical, style short, stigma 3-lobed, fruit ¼ inch long small red. *Wall. in DC. Prod.* xiv. *p.* 633. Osyris Wightiana, *Wall. in DC. Prod. l. c.*

This shrub is common on all the mountains on the west side of the Presidency and in Ceylon 5000-8000 feet, it is also found in North Bengal.

Analysis, Pl. XXVI, fig. 6-A.

Dissections of flowers and fruit. (Copied from Dr. Wight's *Icones.*)

ORDER LXVII—SALICACEÆ.

Flowers diœcious naked or with a cup-like bract sessile or shortly pedicelled arranged in sessile lateral subterminal aments, perianth none, torus swelling into a simple or double gland or an obliquely truncated ring or cup. *Male* : stamens 2-many distinct or monodelphous exserted from the centre of the torus, filaments filiform, anthers 2-celled fixed at the base, cells parallel dehiscing longitudinally, rudiment of ovary none. *Female* : ovary free sessile or pedicelled 1-celled formed of 2 carpels with the margins valvately connate or more or less inflexed, ovules numerous erect anatropal at the base of the cell or adhering to the lower part of the sides, styles 2 generally connate or wanting. Stigmas 2-entire or 2-parted the divisions more or less filiform, or fleshy. Capsule leathery 1-celled 2-valved many-seeded, valves separating at the apex, at length more or less revolute, seeds small erect from the lower part of the axis of each valve or from the base of the cells completely covered with long silky hairs which arise from the short funicle, testa membranaceous, albumen none. Embryo erect, cotyledons plane convex elliptic, radicle small inferior. Trees or shrubs, leaves alternate simple entire or more or less serrulate often bearing glands at the serratures, penniveined or obsoletely palminerved, deciduous, stipules scaly deciduous or foliaceous and often persistent oblique subserrate.

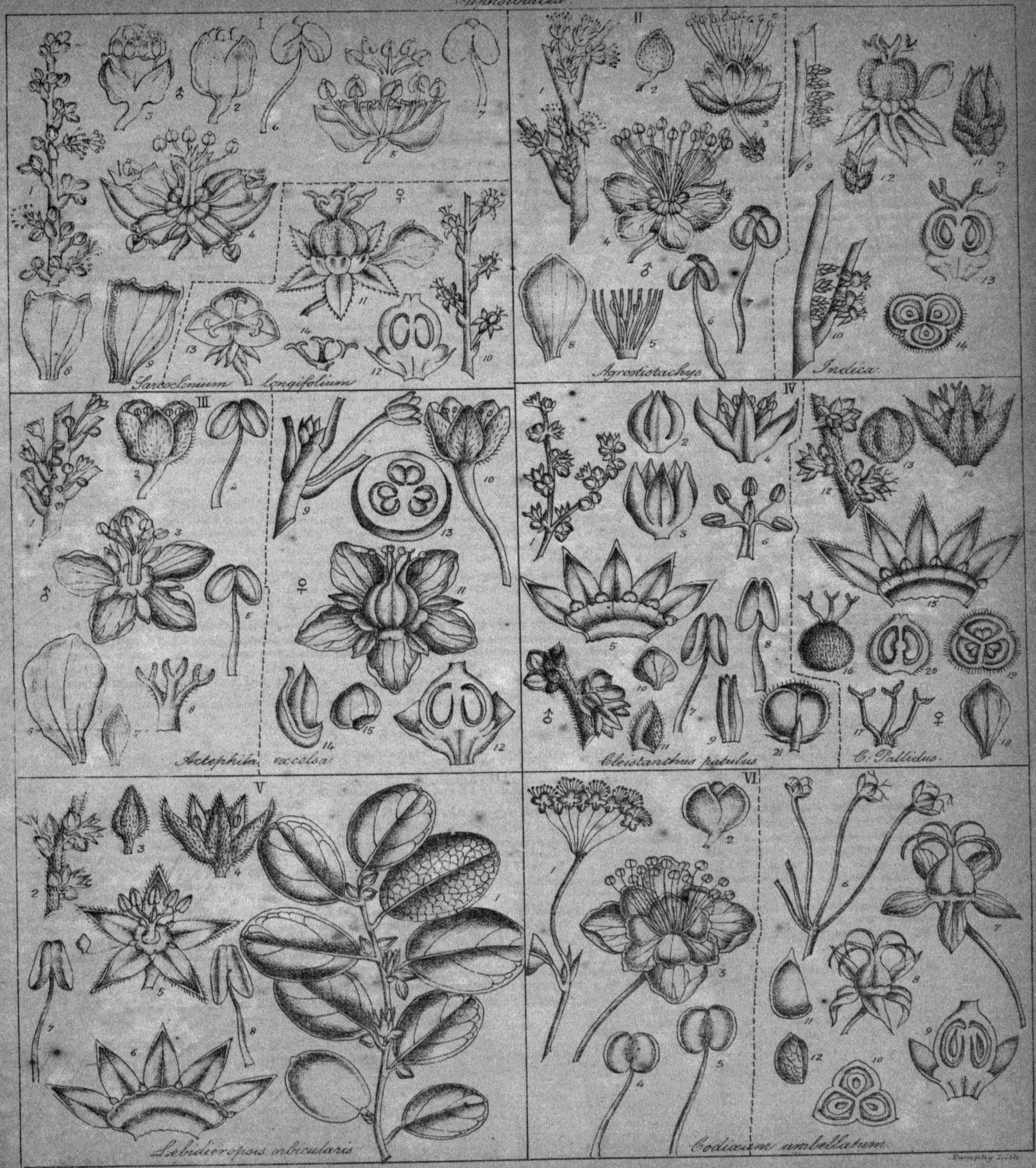
This order is only represented in Southern India by one species of Willow (Salix tetrasperma), which is found from the sea level up to the top of our highest mountains. The same species of Salix and several others are found in N. India, and 2 species of Populus (Poplar.)

The Salix Babylonica (or Weeping Willow) is an introduced tree in Southern India.

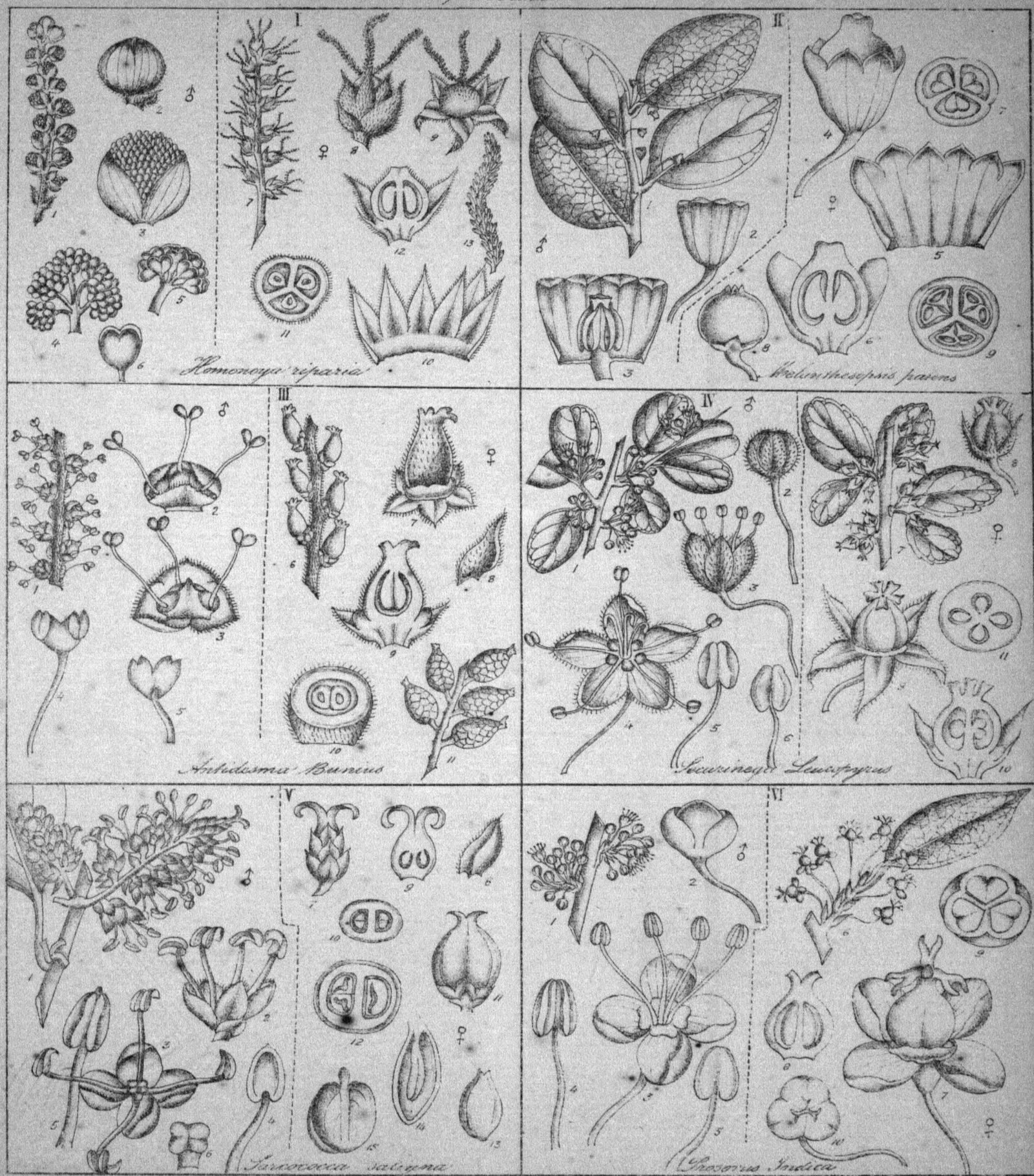
SALIX. LINN.

For Gen. Char. see letter-press to Pl. cccII.

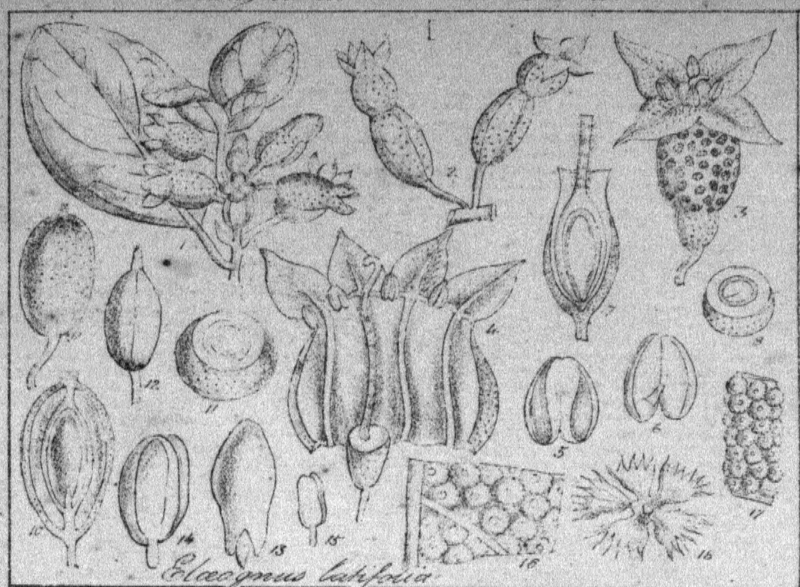
1. SALIX TETRASPERMA, *Roxb.*—For description, &c. see Pl. cccII.



Dorrophy Lith.

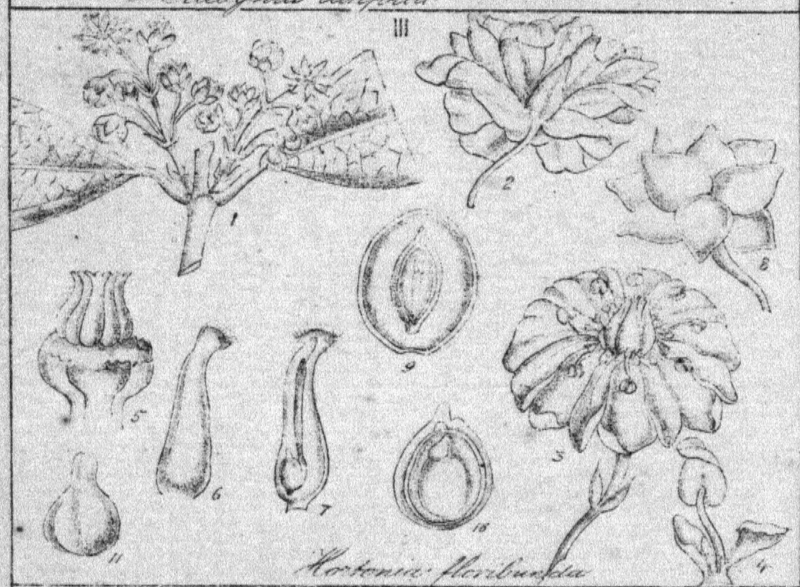

I
II
III
IV
V
VI
Homonoya riparia
Drypetes Indica
Antidesma Bunius
Securinega Leucopyrus
Sarcococca saligna
Croton Indica

Elaeagnaceæ Thymelaeaceæ Myoporineæ

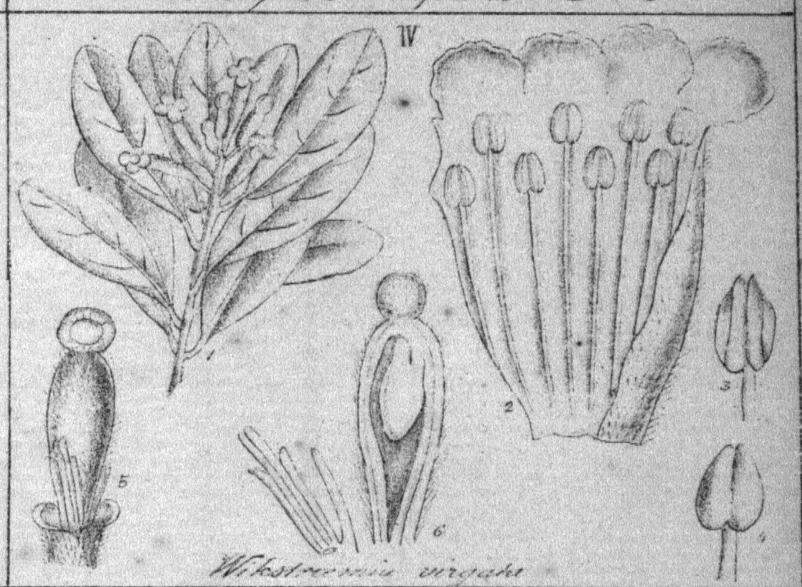


Elaeagnus latifolia

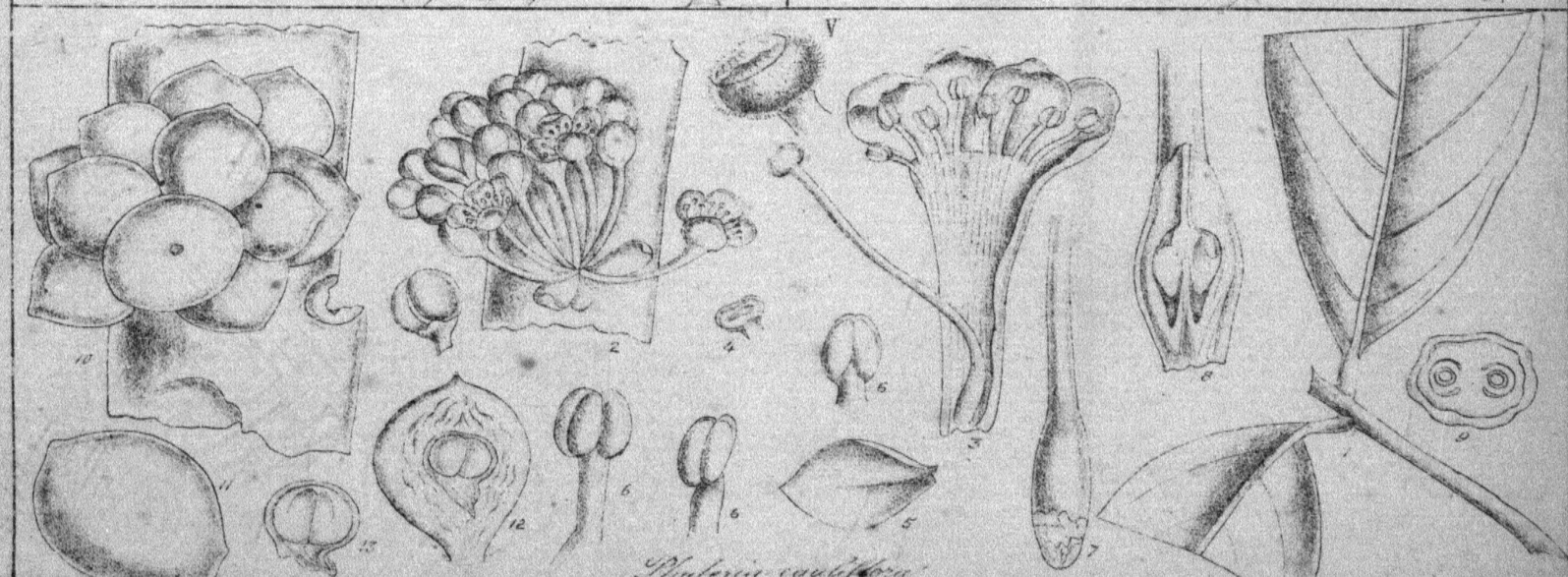
Lasiosiphon eriocephalus



Hortonia floribunda



Wikstroemia virgata



Myoporum laetum